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# NAVAL POSTGRADUATE SCHOOL
## Monterey, California

AD A102310

# THESIS

A METHODOLOGY FOR ECONOMIC ANALYSIS OF PROPOSED
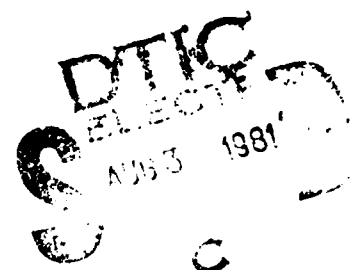AUTOMATION PROJECTS OF THE SHORE SUBSYSTEM OF THE
NAVAL TELECOMMUNICATIONS SYSTEM

*by*

Joanne M. Mosig

March, 1981

Thesis Advisor:                                    D. C. Boger

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| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER | 2. GOVT ACCESSION NO. AD-A103310 | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE (and Subtitle)<br>A Methodology for Economic Analysis of Proposed Automation Projects of the Shore Subsystem of the Naval Telecommunications System . | | 5. TYPE OF REPORT & PERIOD COVERED<br>Master's Thesis<br>March, 1981 |
| | | 6. PERFORMING ORG. REPORT NUMBER |
| 7. AUTHOR(s)<br>Joanne M. Mosig | | 8. CONTRACT OR GRANT NUMBER(s) |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br>Naval Postgraduate School<br>Monterey, California   93940 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br>Naval Postgraduate School<br>Monterey, California   93940 | | 12. REPORT DATE<br>March, 1981 |
| | | 13. NUMBER OF PAGES<br>107 |
| 14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)<br>Naval Postgraduate School<br>Monterey, California   93940 | | 15. SECURITY CLASS. (of this report)<br>Unclassified |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

| | |
|---|---|
| ECONOMIC ANALYSIS | LDMX |
| TELECOMMUNICATIONS | RIXT |
| NAVAL TELECOMMUNICATIONS SYSTEM | NAVCOMPARS |

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This thesis presents a historical perspective on progress toward the objective of automating the Naval Telecommunications System (NTS) in the most economical manner possible. In addition, a methodology for conducting economic analysis of proposed automation projects will be developed. This methodology is based on concepts such as the analysis of geographical areas and telecommunications needs therein, as opposed to the current practice of site-by-site analysis. The basic premise of the methodology is that

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Block 20 (cot'd.):

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A Methodology for Economic Analysis of Proposed
Automation Projects of the Shore Subsystem of the
Naval Telecommunications System

by

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Lieutenant, United States Navy
B.S., Jacksonville University, 1976

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN TELECOMMUNICATIONS SYSTEMS MANAGEMENT
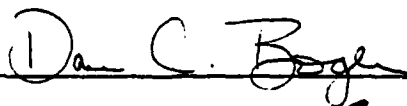
from the

NAVAL POSTGRADUATE SCHOOL
March, 1981

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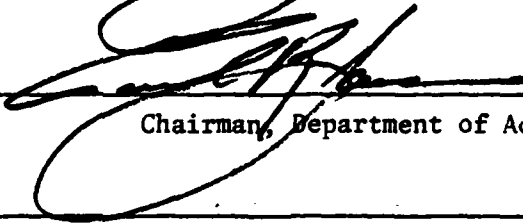
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## LIST OF ABBREVIATIONS

ACP              Allied Communications Publication

ADP              Automatic Data Processing

ASC              Automatic Switching Center

AUTODIN          Automatic Digital Network

CNO              Chief of Naval Operations

COMNAVCOM        Commander, Naval Communications Command

COMNAVTELCOM     Commander, Naval Telecommunications Command (formerly
                 COMNAVCOM)

DEPSECDEF        Deputy Secretary of Defense

DoD              Department of Defense

ECC              Electronic Courier Circuit

IS/A AMPE        Inter Service/Agency Automated Message Processing
                 Exchange

LDMX             Local Digital Message Exchange

MPS              Message Processing System

MTCC             Marine Telecommunications Center

NAVCAMS          Naval Communications Area Master Station

NAVCOMMUNIT      Naval Communications Unit

NAVCOMPARS       Naval Communications Processing and Routing System

NAVCOMSTA        Naval Communications Station

NAVTELSYSIC      Naval Telecommunications System Integration Center

NCAP SPP         Naval Communications Automation Program Subsystem Project
                 Plan

NCS              National Communications System

| | |
|---|---|
| NTCC | Naval Telecommunications Center |
| NTS | Naval Telecommunications System |
| OTC | Over-the-Counter |
| PVLCC | Present Value Life Cycle Cost |
| RIXT | Remote Information Exchange Terminal |
| SAT | Standard AUTODIN Terminal |
| SEC DEF | Secretary of Defense |
| SRT | Standard Remote Terminal |
| TCC | Telecommunications Center |
| WWMCCS | Worldwide Military Command and Control System |

# I. INTRODUCTION

The current impetus for the Naval Telecommunications System is the implementation of automation in the most economical manner possible. Reaching this goal has been an evolutionary process that began in the mid-sixties with the realization that then-current communications systems were not meeting the critical command and control needs of the service. The initial response to this need was maximum automation at any cost. More recently, however, the approach has been modified to reflect the changing times and the decrease in the criticality of the need.

Although concepts have changed, actions corresponding to the concepts have been slow to respond. Economic analyses of proposed automation do not currently examine, in a quantifiable way, all of the benefits to be derived from automation, nor do they address whether proposed alternatives are cost-effective. The analyses are still based upon imperfect or incomplete considerations of cost. This can be seen in the way alternatives are presented: usually, the options offered are full automation or none at all.

In the following chapter, the question of automation will be put in historical perspective, and the evolution of the current system will be described. Chapter III presents more detail about the developments of the past five years, and describes the Naval Telecommunications Automation Program Subsystem Project Plan (NTAP SPP). In Chapter IV, an analytical methodology will be developed, and, in Chapter V, this methodology will be applied to two proposed automation projects. The final chapter will summarize conclusions and present recommendations.

II.  HISTORY OF THE DEVELOPMENT OF THE AUTOMATION PROGRAM

A.  BACKGROUND

In the autumn of 1966, in the course of a fleet exercise entitled BASELINE II, it became apparent that there were a number of inadequacies in the Navy's communications system, specifically with respect to its ability to meet the critical requirements of expeditious handling of command and control message traffic. High-precedence messages of a time-sensitive nature, which had a direct bearing on the success or failure of operations, were unacceptably delayed. "For example, 50 percent of all FLASH precedence messages to a ship required 57 minutes or longer in transit, and 50 percent of all IMMEDIATE precedence messages required 2½ hours or longer in transit." [4:1]

The minimum acceptable standard in such situations is stated in an Allied Communication Publication, ACP 121. It is ten minutes for FLASH messages, and 30 minutes for IMMEDIATE messages. Upon investigation, the delays encountered during the fleet exercise were determined to have been caused by processing delays in transmitting and receiving communications centers, and these processing delays, in turn, were attributed to the numerous manual operations required in processing the messages. These manual operations were slow and error-prone, and they also tended to compound themselves during periods of crisis, when volume increased drastically over a short period of time. In response to these deficiencies related to manual operations, the Chief of Naval Operations (CNO) directed, in November of 1967, that a single program be developed to encompass all

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activities associated with the automation of naval communications. This
program was to be directed by the Commander, Naval Communications Command
(COMNAVCOM). The CNO further directed that "message processing automation
be based on a system concept, applicable to both afloat and ashore com-
munications, consisting of two primary modularized system components, the
LDMX (Local Digital Message Exchange) and the NAVCOMPARS (Naval Communi-
cations Processing and Routing System)." [4:3-4]

In compliance with this directive of the CNO, COMNAVCOM--now known
as Commander, Naval Telecommunications Command, or COMNAVTELCOM--developed
the Naval Communications Automation Program Subsystem Project Plan (NCAP
SPP) in February, 1969. [7:3-1] While the NCAP SPP was being developed,
many changes were taking place in the Department of Defense (DoD) that
would impact on the Navy's automation plans. Policy decisions were made
to the effect that all future costs would have to be considered in the
conceptual and programming phases of any Automatic Data Processing (ADP)
or telecommunications systems. Moreover, in 1968, the Secretary of Defense
(SEC DEF) added the constraint that all LDMX systems would be justified
and approved on a case-by-case basis regardless of cost. [7:3-1] These
changes initiated the train of events that determined how analyses of
automated sites were made.

Changes were also made in the organization of communications facili-
ties. As the result of a directive issued by the Deputy Secretary of Defense
(DEPSECDEF) in April of 1969, telecommunications centers (TCC's) were
created by consolidating separate message and communications functions.
DEPSECDEF lent further emphasis to this consolidation effort a year later,
when he mandated the consolidation of all TCC's within a discrete geographic

area regardless of service or agency affiliation. [5:3-4] These changes were to be reflected in the Navy's future automation plans, but they were not reflected in the initial NCAP SPP, which was approved by CNO in June of 1971.

## B. NCAP SPP OBJECTIVES

"The primary objective of the Naval Communications Automation Program is to obtain, on an evolutionary basis, a fully automated naval communications system which satisfies overall requirements such as speed, reliability, security, and equipment compatibility." [4:5-2] In addition to this primary objective, the NCAP SPP cited several specific objectives:

1. To obtain near-real-time exchange of information critical to the command and control of forces afloat through the automation of message processing functions.

2. To provide communications processing, switching, and distribution capabilities required for the exchange of logistic and support information needed to support and maintain force readiness.

3. To achieve the most economical use of resources obtainable only by the automation of communications and information-transfer functions.

4. To obtain the flexibility necessary to maintain critical communications through the selection of transmission media.

5. To reduce supervisory and other manpower requirements by providing automated communications techniques.

6. To use modular design techniques and centralized software control in the interest of equipment standardization and compatibility.

These objectives were published in the original SPP in 1969. When the revised SPP was printed in 1970, the primary objective was unchanged, but specific objectives 3, 4, and 6 had been modified as follows [5:5-2]:

3. To achieve the most cost-effective use of resources through the consolidation of facilities.

4. To obtain maximum utilization of resources, and the flexibility necessary to maintain critical communications, through the automatic selection of transmission media.

6. To use standard modular design and centralized software control in the interest of equipment standardization, compatibility, maintainability, logistic support, and the conservation of resources.

These changes reflected the changes in DoD's approach to the consolidation of facilities, mentioned previously. They also reflect a change in attitudes toward limiting the costs of automation.

In 1972, the SPP was again revised. As before, the primary objective was unchanged, but all of the specific objectives had been modified [6:5-3]:

1. Increased speed of service

2. Accuracy--reduction of the error rate to less than 1% of message traffic handled

3. Security--reduction of security violations to near zero

4. Reliability--reduction of misroutings and non-deliveries to one in ten million

5. Expandability--facilitation of handling up to 8,000 messages per day and satisfying new requirements without major system upgrade or personnel retraining

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In short, the specific objectives were no longer global system objectives, but had been restated to provide quantitative detail in support of the overall primary objective.

## C. PROGRAM CONCEPT

Although the specific objectives varied between 1969 and 1972, the overall plan for evolutionary implementation did not change. It called for implementation in three phases:

### 1. Phase I--Initial Automation, 1969-1972

This phase was designed to implement immediate automation in an attempt to alleviate the most pressing problems. Specifically, there was an urgent requirement for automated message entry and format conversion. The first phase was intended as a stopgap measure, to serve until the LDMX/NAVCOMPARS systems were operational. To meet this requirement, off-the-shelf systems were leased, so that costs would be held to a minimum if replacement became necessary upon implementation of LDMX/NAVCOMPARS.

### 2. Phase II--Interim LDMX/NAVCOMPARS, 1972-1976

This phase included the acquisition and installation of the LDMX/NAVCOMPARS systems. These systems were expected to be updated and expanded in Phase III. "System capability will be monitored, upgraded, and modified as new equipment, software, and additional interface capabilities are developed and naval communications evolves toward the third, fully-automated phase." [6:7-2]

### 3. Phase III--Full Automation

The concept of Phase III was to provide for a system of LDMX's via standard doctrine, procedures, and formats. The benefits of standard

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methods and system functional redundancy were expected to be realized in terms of significant manpower and monetary savings, coupled with increased capacity and efficiency.

## D. IMPLEMENTATION OF THE PROGRAM (1971-1976)

In June of 1969, the Special Assistant to the Secretary of the Navy approved the requirements for 14 LDMX systems utilizing RCA Series 70/45 equipment. The NAVCOMPARS was designed to utilize two RCA Series 70/45 systems, and, therefore, the 14 systems were deployed as follows:

| | |
|---|---|
| TEST BED | Washington Yard |
| LDMX | OPNAV TCC |
| | NTCC Hampton Roads (CINCLANT/CINCLANTFLT) |
| | TCC Camp Smith (CINCPAC) |
| | NTCC Pearl Harbor (CINCPACFLT) |
| | NTCC Crystal Plaza |
| | NAVCOMSTA San Diego |
| NAVCOMPARS | NAVCAMS LANT (Norfolk) |
| | NAVCAMS WESTPAC (Guam) |
| | NAVCAMS EASTPAC (Honolulu) |
| | NAVCAMS MED (Naples) |

### 1. The LDMX

The LDMX systems were designed to automate the shore telecommunications subsystems, and consequently were installed at the NTCC's serving major commands. The LDMX system provides for the automation of [7:5-3]:

a. Routing and formatting of messages

b. Validation, segregation, and transmission of messages

c. Receipting, editing, and internally distributing messages

d. Filing, recalling, or retransmission of messages

e. Readdressing messages

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f.  Statistics

    g.  On-line terminations of remote terminals

The LDMX does not provide for automated reproduction and distri-
bution for over-the-counter (OTC) message traffic. Automated OTC distribu-
tion is provided for by the Message Processing System (MPS, formerly MRDIS),
AN/FSQ-113(V). This system does not automate the reproduction function, in
order to take advantage of investment costs previously obligated for existing
reproduction devices.

2.  The NAVCOMPARS System

    This system was designed to automate the fleet-shore interface.
In addition to providing for automation of the same functions as the LDMX,
it provides the fleet centers with automation of [7:5-3]:

    a.  Fleet broadcast generation

    b.  On-line termination of ship-shore circuits

    c.  Maintenance of a real-time fleet locator

    d.  Formatting, screening, and distribution via any of several
        transmission media

    With the NAVCOMPARS system, as with the LDMX, OTC distribution
is not provided by the system itself. Phase II of the NCAP SPP was completed
with the installation of the initial 14 systems by UNIVAC, which had pur-
chased RCA's customer base in 1972.

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III.  THE NAVAL TELECOMMUNICATIONS AUTOMATION PROGRAM SUBSYSTEMS

PROJECT PLAN (FORMERLY NCAP SPP), 1977 TO PRESENT

The period from 1966 to 1976 reflected the perceived urgency of the need for automated telecommunications. It was during this period that programs such as LDMX/NAVCOMPARS and satellite communications flourished. The goal was to automate all aspects of the NTS at almost any cost. But by 1976, changes were starting to occur. At first, communications and message processing functions had been consolidated. Subsequently, multiple TCC's at the same discrete geographical location (i.e., on the same base) had been directed to consolidate. These actions were taken to reduce manpower and overhead costs and to reduce the number of TCC's requiring automation.

Due to austere funding and rising manpower costs, the emphasis on consolidation has increased. Today, the emphasis is on consolidating TCC's in the same geographical area whenever feasible. The shift in emphasis is readily apparent in the current objectives listed in the NTAP SPP.

A.  CHANGING GOALS OF THE NTAP SPP

For the reader's reference, the objectives and planning principles of the current NTAP SPP are quoted in full [7:4-1-3]:

> PRIMARY OBJECTIVE
>
> To satisfy existing and future requirements for speed, accuracy, security, and reliability of record information transfer through automation of the NTS in the most economical manner possible.
>
> SPECIFIC OBJECTIVES
>
> a.  To enable the NTS to consistently meet the speed of service for record traffic defined in ACP-121 U.S. Supplement (1).

b.  To reduce error rates to less than 1% in all message traffic handled and to reduce data error rates, uncorrected, to less than one part in $10^5$.

c.  To allow the NTS to satisfy future requirements for real time connectivity between processors for information exchange of all types including data, graphics, etc. between commanders, ships, and landing forces worldwide.

d.  To provide an effective interface with a connectivity to the Navy Command Control System (NCCS), the National Military Command System (NMCS), the Defense Communications System (DCS) including AUTODIN I and AUTODIN II (Integrated Data Network (IDN)), tactical systems and other systems as the need arises.

e.  To provide a capability to effect consolidation of telecommunications facilities and functions within the Navy Department, as well as between military services, to allow reduction in dedicated communications requirements.

f.  To eliminate the current slow and error-prone manual functions and to allow more efficient utilization of personnel resources, with a goal of improving speed of service, despite increasing traffic volumes.

g.  To provide the flexibility, reliability, capacity and throughput speed required to effectively utilize improved transmission media such as FLTSATCOM and AUTODIN and to provide more efficient operation during crisis situations.

h.  To reduce communication functions performed and minimize equipment installed aboard ship.

PLANNING PRINCIPLES

a.  Hardware and software will be developed on a modular basis to allow installation of only those components required to meet the specific requirements at each location.

b.  Hardware and software development will make maximum utilization of standard equipment, state-of-the-art technology and standard off-the-shelf equipment and standard or otherwise available software to minimize development costs and reduce training and maintenance costs to the minimum.

c.  Hardware and software development and procurement will ensure compatibility between all subsystems of the NTS and any other systems to which that subsystem will interface.

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d. Effective system/node quality monitoring and control and management capability will be an integral part of the system.

e. Development of automated systems aboard ships and aircraft and the development of the Fleet/Shore Interchange Subsystem will be accomplished in such a manner as to perform the maximum number of functions possible ashore so as to minimize equipment requirements aboard ships and aircraft.

f. Consideration will be given to reducing multiplicity of sophisticated terminals and terminal features by the use of relatively simple input/output terminals operating under control of a host processing system.

g. Systems will be user-transparent to provide maximum usability with minimum training.

h. Existing communications doctrine and procedures will be modified to take better advantage of automated telecommunications systems.

i. Maximum advantage will be made of existing or planned National, DOD, Joint and Allied common user systems to reduce Navy life cycle costs.

j. Navy systems, to the maximum extent possible, will provide a single end-to-end service to support both the GENSER and SI communities.

From an examination of this document, it becomes apparent that a great deal has changed in comparison with the earlier objectives of the NCAP SPP, discussed in the previous chapter. A greater emphasis is placed on consolidation, economy, and the concept of full automation. Of particular significance is the addition of the phrase "in the most economical manner possible" to the primary objective. No longer is automation the only goal; it is now tempered by considerations of effective utilization of people, equipment, and dollars. The emphasis has shifted to purchasing the most appropriate automation for the dollar. In response to this emphasis, the major programs of the NTAP SPP for automation ashore are the LDMX and Remote Information Exchange Terminal (RIXT) programs.

B.  THE LDMX/NAVCOMPARS PROGRAM

The LDMX automation program first became operational with the accept-
ance of the OPNAV TCC LDMX system in December of 1971. As mentioned pre-
viously, 14 LDMX systems were purchased and installed to create six LDMX
sites at NTCC's serving major commands and four NAVCOMPARS systems at the
Naval Communications Area Master Stations (NAVCAMS). In 1976, recognizing
the need for increased processing speeds and capabilities in the NAVCOMPARS,
procurement action was initiated to purchase the UNIVAC 90/60 system for
installation at the following sites [1:8]:

| | |
|---|---|
| TEST BED | Naval Telecommunications System Integration Center (NAVTELSYSIC) |
| LDMX | Naval Communications Unit (NAVCOMMUNIT), London |
| NAVCOMPARS | NAVCAMS LANT (Norfolk) <br> NAVCAMS EASTPAC (Honolulu) <br> NAVCAMS WESTPAC (Guam) <br> NAVCAMS MED (Naples) <br> NAVCOMSTA STOCKTON (California) |

Installation of the UNIVAC 90/60 at the four NAVCAMS will release
eight LDMX UNIVAC 70/45 systems for reutilization. On September 6, 1978,
the Assistant Secretary of the Navy (Financial Management) approved the
reutilization of these eight systems. [1:8] As a result, LDMX systems
have been installed at [7:5-5]:

NTCC Bangor
NTCC North Island
NTCC Roosevelt Roads
NTCC Charleston

and are scheduled to be installed at [1:9]:

MTCC Camp LeJeune
NTCC Jacksonville
NTCC Breezy Point
NSA New Orleans

This action has met the dual need for additional LDMX systems and increased capabilities of the NAVCOMPARS in compliance with the NTAP SPP objective of automation in the most economical manner possible.

C. THE RIXT PROGRAM

In striving to reach its goal of full automation, the Navy established the RIXT program. This system provides the automated capabilities of the host LDMX/NAVCOMPARS electronically to TCC's in the same geographical location, thus providing mainframe computer system capabilities to TCC's whose requirements do not justify installation of an LDMX. [7:5-5] The automated capabilities extended by the RIXT include message entry, logging, file and retrieval, distribution assignment and update, message transmission, duplicate search, and special handling.

D. SYSTEM CONCEPT

Below is a simple block diagram of the interface between the LDMX and the RIXT, and between the LDMX and the Automatic Digital Network (AUTODIN):
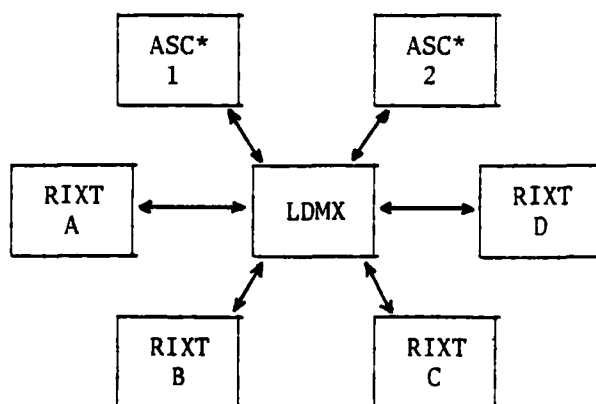


*Automated Switching Center--a node within the AUTODIN network

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All traffic destined for, or transmitted from, the RIXT installations must be processed through the host LDMX system. Because of this relationship, any computer failure at a host LDMX site will cause a reciprocating outage at its satellite RIXT TCC's. Another relationship between the LDMX and the RIXT involves the message processing functions assumed by the LDMX. These functions require LDMX personnel to perform supporting duties such as updating RIXT internal distribution and routing files, or manually intervening to correct non-standard traffic to or from the RIXT. In light of these relationships, it seems clear that the LDMX and its attached RIXT(s) constitute a system, over which, for the purposes of analysis, all benefits and costs should be spread. The term "LDMX total system," as used henceforth, should be understood in this context.

IV.   COST-EFFECTIVENESS METHODOLOGY FOR AUTOMATION OF COMMUNICATIONS

The current emphasis on providing automation in the most economical manner possible makes manifest the need for a relevant, practical, and comprehensive cost-effectiveness methodology. There being no such methodology documented in the existing literature, the author has developed one. It will be presented in this chapter.

A.   EFFECT OF THE CHANGE IN PRIMARY OBJECTIVE

The original primary objective of the NTAP SPP stressed the concept of automation at all costs. Over the years, this approach has been considerably moderated; the present concept is automation in the most economical manner possible. This philosophy is one of the most important single considerations in the analysis of potential sites for automation. Automation is most cost-effective when the sites being automated process large volumes of traffic. The underlying reason for this is that the processing of large volumes of traffic in a manual or semi-automated TCC is highly manpower-intensive. Therefore, in upgrading the TCC to an automated operation, manpower may be reduced. If, however, the volume of traffic processed by a manual or semi-automated TCC is relatively low, then manpower levels will also in all likelihood be low, and implementing an automated system may actually increase manpower costs.

Another fundamental reason for the association of large message volume with increased cost-effectiveness after automation springs from the relationship of traffic volume to other effectiveness measures, notably

reliability, speed of service, and accuracy. In a semi-automated or manual TCC operation, as the volume of traffic processed increases, these effectiveness measures inevitably diminish, and conversely, as volume peaks and then falls off, the reliability, speed, and accuracy of the operation tend gradually to improve. Automation of large-volume TCC operations thus makes sense from the point of view of all effectiveness measures.

A third and more subtle reason for automating large-volume TCC's is that they tend, very naturally, to be associated with major commands, and major commands, in relation to other activities, generate a higher proportion of critical, time-sensitive command and control traffic. This, indeed, was the concept used to identify sites for installation of the initial LDMX's. At a major command, there is inevitably a large volume of traffic, with a greater chance that the traffic includes a significant percentage of critical messages.

Because high message volume is positively correlated with all of the benefits to be derived from automation, it is recommended that, in extreme cases of exceptionally low volume, if consolidation of facilities is not feasible for geographical or other reasons, the burden of persuasion for automation be placed upon the activity involved. There may be some few small TCC's whose messages are very infrequent but very vital--so vital that even the possibility of human error must be avoided. In the vast majority of cases, however, the situation is apt to be just the reverse. If an operation is economically marginal to begin with, its existence may nonetheless be justifiable on military grounds, but its expansion, by means of major capital outlays, is probably not. This concept should be reflected in the primary objective.

B. DEFINITION OF THE SCOPE OF THE ANALYSIS AND ALTERNATIVES

Defining the scope of analysis has to do with the perspectives used in making automation decisions. Because of the specific connectivity objective of the NTAP SPP, decisions should be made on the basis of telecommunications center operations within a defined geographical area. This would allow evaluation of the following alternatives:

1. Whether or not TCC consolidation could be effected;

2. Whether area traffic volumes could support a single LDMX-RIXT configuration with another automated system as its geographical backup; or

3. Whether area traffic volumes could support two LDMX-RIXT systems, with each LDMX total system providing backup to the other (e.g., the Pearl Harbor-Camp Smith configuration).

When the scope of analysis is limited to a site-by-site approach, a full analysis of the need for connectivity within the area is impossible. Another significant drawback of site-by-site analysis is that it does not allow for LDMX total system analysis. As mentioned previously, to ignore the dependent relationships between LDMX and RIXT installations is to ignore the fact that RIXT installations benefit from the LDMX connectivity through lower capital and operating costs, while providing the LDMX with a larger output performance measure to allocate its costs.

In determining the alternatives, it is essential that the primary objective be kept in mind--automation in the most economical manner possible. This does not mean that each geographical area which requires automation should be automated with an LDMX. The LDMX was designed for high-volume OTC traffic and high connectivity. At low traffic volumes, the LDMX is not

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cost-effective, in that it requires fairly large outlays for manpower, maintenance, and AUTODIN equipment and circuits. Other automated or semi-automated alternatives, such as AUTODIN terminals or Standard Remote Terminals (SRT), should be considered in order to meet the primary objective of economical automation.

## C.  THE PROCEDURE

The methodology formulated here provides decision-makers with the most complete and relevant information available, in order that they will be better able to make intelligent and justifiable decisions.

### 1.  Determining Alternatives

The initial step in this methodology is to identify all viable options to be considered. Any analysis which excludes one or more feasible solutions may lead to the presentation of incomplete data, and may, in the worst case, fail to consider the best possible solution.

In evaluating alternatives for any given site, it is best to evaluate in light of the needs and capabilities of other facilities within the same area. Therefore, a geographical area should be well-defined, and all communications facilities within that area should be identified and evaluated as to their present operations. Data compiled for each site should include traffic records, reliability figures, accuracy figures, speed of service figures, annual operating costs, anticipated recurring costs, and all manpower-related costs. Based upon this information, all sites can be placed into one of three categories: (1) sites not requiring automation based on *a priori* considerations, though they may be considered for consolidation if that is a feasible alternative; (2) sites constituting

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either the primary or the back-up facility of an area--in other words, one of the area's two largest-volume facilities; or (3) remaining sites.

Actual determination of alternatives is based on the message volume of the area as a whole. If message volumes are very low, it would be foolish to consider multiple LDMX sites, and, conversely, if the area message volume is quite high, it is impractical to exclude automation by means of LDMX from the alternatives. The alternatives must be presented on an area basis. For example:

Alternative 1--Retain all present systems.

Alternative 2--Automate the primary site with other than LDMX hardware; retain all other sites as is.

Alternative 3--Automate the primary site with LDMX, automate the backup site with SRT, automate sites C, D, F, G, I, and K with RIXT, and retain all other sites as is.

Alternative 4--Automate the primary and backup sites with LDMX, automate sites A, B, C, F, and G with RIXT homed to the primary site, and automate sites D, E, H, and I with RIXT homed to the backup site.

These examples are not exhaustive, but they illustrate the area approach, and allow consideration of the effects of the various alternatives on a geographical basis. This becomes very important when considering the LDMX/RIXT configuration. If each site is analyzed individually, the supporting nature of the connectivity among sites may not be recognized, or its full impact may not be appreciated.

2. Evaluating Costs and Benefits/Effectiveness

Once the alternatives are determined--including the baseline alternative, which is to retain the current system--comparisons may be

made among the alternatives with regard to specific categories of compiled data. The cost data for all alternatives is most easily dealt with when presented in terms of present-year dollars. In accordance with standard government procedure, these cost figures must be presented as present-value life cycle costs.

This methodology uses incremental cost to evaluate the alternatives. For example, if Alternative 1, the baseline alternative, already costs $x$ dollars, we would seek to determine and quantify the increase in benefits resulting from the expenditure of $y$ dollars to implement Alternative 2. We would then do likewise with regard to the expenditure of $z$ dollars to implement Alternative 3, and so forth. In order to prepare this last part of the analysis, the incremental increases in benefits--such as speed of service, reliability, and accuracy--must be computed for each alternative and compared to the baseline alternative. Finally, these incremental figures are related to the incremental costs of implementing the various alternatives.

### 3. <u>Comparing Costs/Benefits of Alternatives and Rank Ordering</u>

The comparison of the costs and benefits associated with each alternative is an important part of any economic analysis. What we seek is the following type of reasoning: If Alternative 3 is selected, then reliability can be increased by a factor $a$ at an incremental cost of $b$ dollars, whereas if Alternative 4 is implemented, it will increase reliability by a factor $c$ at a cost of $d$ dollars. The whole purpose of the comparisons is to develop data to aid decision-makers. Rank ordering of the data facilitates the decision-making process. Any means of rank ordering which provides a relevant assessment of the data should be utilized.

Two such approaches might be rank ordering by least cost, and rank ordering by greatest incremental increase in benefit derived, for each of the benefit measures. From such data, decision makers will be best able to determine what tradeoffs are involved for each alternative, and will thus be able to make the most cost-effective allocations of limited resources.

V.   EVALUATION OF TWO PROPOSED LDMX TOTAL SYSTEMS

Inter-Service Agency Extension of Automation Feasibility Studies were conducted on the Norfolk and New Orleans areas in August of 1980. Not all communications facilities in the area were analyzed. Rather, analysis was limited to those naval facilities in the area which were not already automated, together with the facilities of any other service or Defense agency which wished to be considered. The analysis examined which TCC's should be connected to the LDMX scheduled to be installed in each area. With respect to each TCC, the alternatives considered were: to retain the present system, to install a RIXT configuration, or to consolidate with another local TCC. The capital, traffic, and cost data developed by these studies were used in the preparation of Appendices A through D.

These studies did not quantify the benefits expected to be derived from automation, nor did they evaluate the option of automating with other than LDMX hardware. Because of the limitations of the scope (not all TCC's considered) and the lack of quantification of benefits in the studies, an evaluation of these two sites cannot be made in accordance with the methodology developed in the preceding chapter. Evaluation will be as complete as possible, given the data available.

A.  NTCC BREEZY POINT

1.  Determining Alternatives

Table V-1, below, lists the communications facilities considered to be in the Norfolk geographical area. The status of each facility is also

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given: currently automated, candidate for automation, or not recommended
for automation "in view of low traffic volume and high cost." [6:ii] The
study does not specifically delineate the geographical area in question,
nor does it specifically state that all of the local communications facili-
ties are listed.

| TCC LOCATION | STATUS |
|---|---|
| HQ, Commander in Chief, U.S. Atlantic Fleet | Automation complete. Not included in the study. |
| HQ, Commander, Submarines Atlantic | Same |
| HQ, Commander, Oceanographic Systems Atlantic | Same |
| NTCC Hampton Roads | Same. LDMX equipped. Extends auto-mation to the preceding TCC's. |
| HQ, Commanding General, Fleet Marine Forces Atlantic | Automation approved and scheduled for FY81. Not included in study. |
| NTCC Breezy Point | Candidate is evaluated in study, recommended for automation by in-stalling LDMX. Programming ap-proved for FY82. |
| Naval Supply Center, Norfolk, Virginia | Candidate evaluated in study and recommended for automation. Pro-gramming approved for FY82. |
| Naval Air Station, Oceana, Virginia | Same |
| NTCC Portsmouth, Virginia | Same |
| Naval Weapons Station, Yorktown, Virginia | Same |
| Coast Guard District Five, Portsmouth, Virginia | Candidate evaluated in study; automation recommended. |

Table V-1

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| TCC LOCATION | STATUS |
| --- | --- |
| Coast Guard Air Station, Elizabeth City, North Carolina | Candidate evaluated in study. Automation not recommended in view of low volume traffic and high cost. |
| Adjutant General, Virginia National Guard, Richmond, Virginia | Same |
| U.S. Army Corps of Engineers, Norfolk, Virginia | Same |
| Fort Story Element, U.S. Army Communications Command, Fort Eustis, Virginia | Same |

Table V-1 (cot'd.)

It is impossible to determine which are the primary and backup facilities, since the sites previously automated are not analyzed in the study. This, in turn, makes it impossible to determine whether certain alternatives are valid. For example: Is the LDMX at NTCC Hampton Roads able to support additional RIXT's? Can the total message volume of the geographical area support two LDMX installations? Should the planned RIXT installation be connected to the proposed LDMX at NTCC Breezy Point, or to the existing one at NTCC Hampton Roads?

An additional limitation of the data in the feasibility study lies in its failure to address multiple alternatives. The questions of whether or not to consolidate, and whether or not to automate, were addressed, but the question of what type of equipment to use in automating was not even asked. As a result, only data relating to existing systems, and to LDMX/RIXT installations, were presented.

Ideally, the feasibility study would have delineated the Norfolk geographical area, and would have given a complete list of the communications facilities located therein, regardless of service or Defense agency affiliation. Furthermore, complete information as to current operating costs, manpower costs, non-recurring costs, traffic data, subscriber data, and performance data should have been presented for every communications facility, without exception. Based on this information, alternatives could have been presented as to what the cost and performance impact would have been for each site if it were to be consolidated, to remain unchanged, or to be fully or semi-automated.

## 2. Evaluating Costs and Benefits/Effectiveness

The feasibility study presented the costs for FY80-FY84 in FY80 dollars. The period of consideration was set at five years in order to coincide with the Five Year Defense Program. Costs were presented on a yearly basis, and, with the exception of a two-alternative cost comparison in the executive summary, life cycle costs were not computed. In addition, in the preparation of the executive summary figures, annual costs were merely summed, rather than being discounted for FY81 through FY 84 and presented as present value life cycle costs (PVLCC).

Under the methodology proposed here, PVLCC would be computed for each alternative, using the equation

$$PVLCC = C_{80} + \frac{C_{81}}{(1+.1)^1} + \frac{C_{82}}{(1+.1)^2} + \frac{C_{83}}{(1+.1)^3} + \frac{C_{84}}{(1+.1)^4} + \frac{C_{85}}{(1+.1)^5} ,$$

where $C_n$ represents the cost in year $n$.

The discount figure of 10% was used in accordance with DoD Inst. 7041.3.* Because the LDMX is currently scheduled for replacement in FY85 by the Inter Service/Agency Automated Message Processing Exchange (IS/A AMPE), the life cycle used is FY80 through FY85. In all probability, the system will be in place much longer, but this possibility is not documented, so the life cycle must be limited to these years.[†]

For the proposed RIXT installations as a group, the PVLCC was $9,056.0K for remaining unchanged, and $9,335.4K for automating. This represents an incremental cost of $279.4K. (See Table V-2.) For the LDMX total system, the PVLCC for the baseline alternative was $14,359.1K as opposed to $16,849.0K for automation, representing an incremental cost of $2,309.9K. (See Table V-3.) Data for alternatives other than LDMX/RIXT were not provided, and therefore PVLCC for alternatives such as SRT or Standard AUTODIN Terminals (SAT) are not presented.

In evaluating each alternative, separate consideration must be given to each benefit derived. The output and effectiveness measures (i.e., total messages, reliability, accuracy, and speed of service) must be evaluated on an individual basis. The data should be presented in terms of incremental benefit derived versus incremental cost. These incremental changes in effectiveness and cost are measured with respect to the baseline alternative, which represents current, non- or semi-automated communications facility operations.

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*Sensitivity analysis was conducted using 5% and 15% rates, but the results did not change the evaluation.

[†]Sensitivity analysis of the planning range was not conducted due to the lack of data concerning capital and operating costs beyond FY85.

NTCC BREEZY POINT RIXT

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 | TOTAL |
|---|---|---|---|---|---|---|---|
| **NON-RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 47.7 | 37.6 | 96.0 | -- | -- | -- | 181.3 |
| Present Value | 47.7 | 34.2 | 79.3 | -- | -- | -- | 161.2 |
| Alternative 2 | | | | | | | |
| FY80 $ | -- | -- | 904.4 | 79.2 | -- | -- | 983.6 |
| Present Value | -- | -- | 747.4 | 59.5 | -- | -- | 806.9 |
| **RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 275.3 | 275.3 | 275.3 | 275.3 | 275.3 | 275.3 | 1,651.8 |
| Present Value | 275.3 | 250.3 | 227.5 | 206.8 | 188.0 | 170.9 | 1,318.8 |
| Alternative 2 | | | | | | | |
| FY80 $ | 275.3 | 275.3 | 265.1 | 265.1 | 265.1 | 265.1 | 1,611.0 |
| Present Value | 275.3 | 250.3 | 219.1 | 199.2 | 181.1 | 164.6 | 1,289.6 |
| **MANPOWER COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 1,581.4 | 1,581.4 | 1,581.4 | 1,581.4 | 1,581.4 | 1,581.4 | 9,488.4 |
| Present Value | 1,581.4 | 1,437.6 | 1,306.9 | 1,188.1 | 1,080.1 | 981.9 | 7,576.0 |
| Alternative 2 | | | | | | | |
| FY80 $ | 1,581.4 | 1,581.4 | 1,464.4 | 1,464.4 | 1,464.4 | 1,464.4 | 9,020.4 |
| Present Value | 1,581.4 | 1,437.6 | 1,210.2 | 1,100.2 | 1,000.2 | 909.3 | 7,239.9 |
| **TOTAL COSTS** | | | | | | | |
| Alt. 1 (Pres. Val.) | 1,904.4 | 1,722.1 | 1,613.7 | 1,394.9 | 1,268.1 | 1,152.8 | 9,056.0 |
| Alt. 2 (Pres. Val.) | 1,856.7 | 1,687.9 | 2,176.7 | 1,358.9 | 1,181.3 | 1,073.9 | 9,335.4 |
| Inc. Cost (2 - 1) | (47.7) | (34.2) | 563.0 | (36.0) | (86.8) | (78.9) | 279.4 |

Table V-2
(Costs in K Dollars)

NTCC BREEZY POINT TOTAL SYSTEM

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 | TOTAL |
|---|---|---|---|---|---|---|---|
| **NON-RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
|   FY80 $ | 47.7 | 37.6 | 96.0 | -- | -- | -- | 181.3 |
|   Present Value | 47.7 | 34.2 | 79.3 | -- | -- | -- | 161.2 |
| Alternative 2 | | | | | | | |
|   FY80 $ | -- | 270.0 | 230.6 | 79.2 | -- | -- | 2,655.2 |
|   Present Value | -- | 245.5 | 1,905.8 | 59.5 | -- | -- | 2,210.8 |
| **RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
|   FY80 $ | 461.2 | 461.2 | 461.2 | 461.2 | 461.2 | 461.2 | 2,767.2 |
|   Present Value | 461.2 | 419.3 | 381.2 | 346.5 | 315.0 | 286.4 | 2,209.6 |
| Alternative 2 | | | | | | | |
|   FY80 $ | 461.2 | 461.2 | 580.4 | 590.3 | 590.3 | 590.3 | 3,273.7 |
|   Present Value | 461.2 | 419.3 | 479.7 | 443.5 | 403.2 | 366.5 | 2,573.4 |
| **MANPOWER COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
|   FY80 $ | 2,540.0 | 2,540.0 | 2,540.0 | 2,540.0 | 2,540.0 | 2,540.0 | 15,240.0 |
|   Present Value | 2,540.0 | 2,309.0 | 2,099.0 | 1,908.3 | 1,734.9 | 1,577.1 | 12,168.3 |
| Alternative 2 | | | | | | | |
|   FY80 $ | 2,540.0 | 2,540.0 | 2,504.0 | 2,504.0 | 2,504.0 | 2,504.0 | 15,096.0 |
|   Present Value | 2,540.0 | 2,309.0 | 2,069.4 | 1,881.3 | 1,710.3 | 1,554.8 | 12,064.8 |
| **TOTAL COSTS** | | | | | | | |
| Alt. 1 (Pres. Val.) | 3,048.9 | 2,762.5 | 2,559.5 | 2,254.8 | 2,049.9 | 1,863.5 | 14,539.1 |
| Alt. 2 (Pres. Val.) | 3,001.2 | 2,975.8 | 4,454.9 | 2,384.3 | 2,113.5 | 1,921.3 | 16,849.0 |
| Inc. Cost (2 - 1) | (47.7) | 211.3 | 1,895.4 | 129.5 | 63.6 | 57.8 | 2,309.9 |

Table V-3
(Costs in K Dollars)

### 3. Comparing Costs/Benefits of Alternatives and Rank Ordering

An important part of an economic analysis is a comparison of the costs of each alternative with the benefits derived from it. The feasibility study only presents a comparison of annual costs. Since the benefits assumed to be derived from automation--increased reliability, speed of service, accuracy, etc.--are not quantified for each alternative, comparisons cannot be made.

Using the proposed methodology, comparisons can be made. For example, if an LDMX is installed at NTCC Breezy Point, 5,643K messages will be processed for 34 commands at one automated site for an incremented PVLCC of $2,616.6K. (See Table V-4). This statement of quantitative fact can be contrasted with a quantitative statement concerning another alternative, with its own impact on volume, subscribers, sites, and incremental PVLCC. The methodology only presents facts; it does not make the decisions. However, these facts should be presented in such a manner as to facilitate the making of a decision. Since the objective is to provide automation in the most economical manner possible, rank ordering of the data is essential to the decision-making process. It is not possible to do this in Table V-4, however, due to the non-consideration of alternatives and non-availability of data concerning effectiveness measures.

NTCC BREEZY POINT
Life Cycle Evaluation Data

| | Other Automated System | LDMX | RIXT | LDMX Total System |
|---|---|---|---|---|
| Total Messages (FY80 through FY 85) | N/A | 6,047.0K | 11,127.0K | 17,174.0K |
| Total Subscribers Served | N/A | 60 | 109 | 169 |
| Total Sites Automated | N/A | 1 | 5 | 6 |
| Incremental Improvement in Speed of Service | N/A | N/A | N/A | N/A |
| Incremental Improvement in Reliability | N/A | N/A | N/A | N/A |
| Incremental Improvement in Accuracy | N/A | N/A | N/A | N/A |
| Incremental PVLCC | N/A | $2,030.5K | $279.4K | $2,309.9K |

Table V-4

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B.  NTCC NSA NEW ORLEANS

   1.  Determining Alternatives

        The feasibility study for the New Orleans area was done follow-
ing the same basic model as was used for the Norfolk area study. It suf-
fers from the same limitations. Although Table V-5 lists the activities
considered to be within the New Orleans area, uncertainty exists as to
the exact limits of the area. and it is impossible to determine whether
all facilities in the geographical area are included in the list.

        The data compiled is essentially the same as for the NTCC Breezy
Point study. It consists of easily quantifiable data such as costs, traf-
fic volumes, and subscriber data. Effectiveness measures--reliability,
accuracy, speed of service--are not included in the tabulation. As in the
Breezy Point study, there were several sites not considered, either because
they were already automated or because they requested not to be considered.
Eliminating these sites from evaluation makes it difficult to determine how
much automation, and what means of automation, the "New Orleans area" can
support. The insufficient data makes it impossible to determine all feasi-
ble alternatives. For example, the idea of consolidating some of the smaller
TCC's with NTCC New Orleans DET Bay St. Louis, Mississippi cannot be analyzed,
because data pertaining to that site were not presented. Ideally, as men-
tioned above, complete data for all sites within the relevant geographical
area would have been presented, so that multiple alternatives for each
site might have been analyzed.

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| TCC LOCATION | RECOMMENDATION |
|---|---|
| NTCC NSA (East Bank) New Orleans | Automate with LDMX in FY82. |
| NTCC NAS Belle Chasse | Automate with RIXT B in FY82. |
| NTCC NSA (West Bank) | Semi-automate with ECC in FY82. |
| NTCC New Orleans DET Bay St. Louis MS | Continue consolidated SI/GENSER TCC operations. |
| TCC 159th Tactical Fighter Group | Close TCC and consolidate with NTCC NAS Belle Chasse |
| TCC Army National Guard, Camp Shelby | No change. |
| TCC Army Corps of Engineers, LMVD Vicksburg, Mississippi | Automate with RIXT C. |
| TCC 2052nd Comm Squadron, Keesler AFB, Biloxi, Mississippi | None. Deleted as a candidate IAW HQ AFCC request. |
| NTCC Construction Battalion Center, Gulfport, Mississippi | Continue current plans to upgrade with SRT homed to ASC. Convert to automation by rehoming to LDMX when available. |
| TCC Superintendent of Ships, Pascagoula, Mississippi | Continue current plans for SRT homed to ASC to provide redundant interconnect to the area. |
| TCC Corps of Engineers, Mobile, Alabama | No change. |
| TCC US Coast Guard District 8, New Orleans | Continue current plans to upgrade with SRT SAT II and install ECC with NAVSUPPACT (EB) for mutual ASC altroute. |
| TCC Louisiana National Guard | No change. |
| TCC ACE New Orleans | No change. |
| TCC ACE (WES), Vicksburg | No change. |
| TCC Waterborne Commerce Stat. | No change. |

Table V-5

2. Evaluating Costs and Benefits/Effectiveness

With the exception of one site, the alternatives presented by
the feasibility study fell into two categories: not to automate, or to
automate with an LDMX/RIXT configuration. One site was considered for an
Electronic Courier Circuit (ECC), but even that alternative was dependent
upon the installation of the LDMX. This alternative cannot be evaluated
here, since the cost is the same for the same volume, and effectiveness
measures are unknown.

The costs delineated in the feasibility study were projected on
an annual basis over the period FY80 through FY84 in order to coincide with
the Five Year Defense Program. However, in the executive summary, the pro-
ject was evaluated on the basis of an eight-year economic life. In addition,
the total annual costs were discounted at a real rate and then inflated.
This approach is in conflict with the preferred method, which is either to
effect discounting and inflation simultaneously, using nominal rates, or
only to discount, at the real rate. It is not essential that the PVLCC be
inflated for the evaluation of alternatives. The inflation calculation is
not essential when comparing alternatives in the planning stage, provided
that inflation has no differential effect on the relative costs incurred
over the life cycle of the system.

The equation presented in A.2., above, was also used here to
determine the PVLCC for the alternatives of maintaining the current opera-
tion, or installing the LDMX/RIXT. In this particular instance, the cost
of Alternative 1 for the RIXT installations is $2,204.5K versus $2,585.1K
for an incremental cost of $380.6K. (See Table V-6.) For the LDMX total
system, incremental cost comes to $2,997.2K. (See Table V-7.) Again, each
effectiveness measure must be considered separately.

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NTCC NSA (EB) NEW ORLEANS RIXT INSTALLATIONS

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 | TOTAL |
|---|---|---|---|---|---|---|---|
| **NON-RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 47.7 | 37.6 | 96.2 | -- | -- | -- | 181.5 |
| Present Value | 47.7 | 34.2 | 79.5 | -- | -- | -- | 161.4 |
| Alternative 2 | | | | | | | |
| FY80 $ | -- | -- | 643.5 | -- | -- | -- | 643.5 |
| Present Value | -- | -- | 531.8 | -- | -- | -- | 531.8 |
| **RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 81.2 | 81.2 | 84.6 | 84.6 | 84.6 | 84.6 | 500.8 |
| Present Value | 81.2 | 73.8 | 69.9 | 63.6 | 57.8 | 52.6 | 398.9 |
| Alternative 2 | | | | | | | |
| FY80 $ | 81.7 | 81.7 | 87.8 | 87.8 | 87.8 | 87.8 | 514.6 |
| Present Value | 81.7 | 74.3 | 72.6 | 66.0 | 60.0 | 54.5 | 409.1 |
| **MANPOWER COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 343.2 | 343.2 | 343.2 | 343.2 | 343.2 | 343.2 | 2,059.2 |
| Present Value | 343.2 | 312.0 | 283.6 | 257.9 | 234.4 | 213.1 | 1,644.2 |
| Alternative 2 | | | | | | | |
| FY80 $ | 343.2 | 343.2 | 343.2 | 343.2 | 343.2 | 343.2 | 2,059.2 |
| Present Value | 343.2 | 312.0 | 283.6 | 257.9 | 234.4 | 213.1 | 1,644.2 |
| **TOTAL COSTS** | | | | | | | |
| Alt. 1 (Pres. Val.) | 472.1 | 420.0 | 433.0 | 321.5 | 292.2 | 265.7 | 2,204.5 |
| Alt. 2 (Pres. Val.) | 424.9 | 386.3 | 888.0 | 323.9 | 294.4 | 267.6 | 2,585.1 |
| Inc. Cost (2 - 1) | (47.2) | (33.7) | 455.0 | 2.4 | 2.2 | 1.9 | 380.6 |

Table V-6
(Costs in K Dollars)

NTCC NSA (EB) NEW ORLEANS LDMX TOTAL SYSTEM

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 | TOTAL |
|---|---|---|---|---|---|---|---|
| **NON-RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 47.7 | 37.6 | 96.2 | -- | -- | -- | 181.5 |
| Present Value | 47.7 | 34.2 | 79.5 | -- | -- | -- | 161.4 |
| Alternative 2 | | | | | | | |
| FY80 $ | -- | -- | 1,817.9 | -- | -- | -- | 1,817.9 |
| Present Value | -- | -- | 1,503.3 | -- | -- | -- | 1,503.3 |
| **RECURRING COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 240.6 | 240.6 | 240.6 | 240.6 | 240.6 | 240.6 | 1,443.6 |
| Present Value | 240.6 | 218.7 | 198.8 | 180.8 | 164.3 | 149.4 | 1,152.6 |
| Alternative 2 | | | | | | | |
| FY80 $ | 241.1 | 241.1 | 359.7 | 359.7 | 359.7 | 359.7 | 1,921.0 |
| Present Value | 241.1 | 219.2 | 297.3 | 270.2 | 245.7 | 223.3 | 1,496.8 |
| **MANPOWER COSTS** | | | | | | | |
| Alternative 1 | | | | | | | |
| FY80 $ | 1,065.0 | 1,065.0 | 1,065.0 | 1,065.0 | 1,065.0 | 1,065.0 | 6,590.0 |
| Present Value | 1,065.0 | 968.2 | 880.2 | 800.2 | 727.4 | 661.3 | 5,102.3 |
| Alternative 2 | | | | | | | |
| FY80 $ | 1,065.0 | 1,065.0 | 1,520.0 | 1,520.0 | 1,520.0 | 1,520.0 | 8,210.0 |
| Present Value | 1,065.0 | 968.2 | 1,256.2 | 1,142.0 | 1,038.2 | 943.8 | 6,413.4 |
| **TOTAL COSTS** | | | | | | | |
| Alt. 1 (Pres. Val.) | 1,353.3 | 1,221.1 | 1,158.5 | 981.0 | 891.7 | 810.7 | 6,416.3 |
| Alt. 2 (Pres. Val.) | 1,306.1 | 1,187.4 | 3,056.8 | 1,412.2 | 1,283.9 | 1,167.1 | 9,413.5 |
| Inc. Cost (2 - 1) | (47.2) | (33.7) | 1,898.3 | 431.2 | 392.2 | 356.4 | 2,997.2 |

Table V-7
(Costs in K Dollars)

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3. Comparing Costs/Benefits of Alternatives and Rank Ordering

As in the case of the Norfolk area study, all relevant alternatives are not presented, and therefore a comparison of costs and benefits for each alternative is not possible. Table V-8 presents the facts that are describable, and indicates how alternatives could be considered as statements. For example: If RIXT installations are implemented, 1,388K messages will be processed for 50 commands at three sites for an incremental cost of $380.6K. This statement could be compared to other statements based on different alternatives for the same sites. In addition, data concerning the improvement in effectiveness measures, and their associated PVLCC, could be compared and rank ordered.

C. OTHER CONSIDERATIONS

Very little has been said concerning the subscribers served by the TCC's. The methodology can do little more than present, for consideration by decision-makers, the number of subscribers and their missions. The relative importance of each subscriber is not a factor which lends itself to quantification. It must, therefore, be considered on a judgemental basis. However, analysis of the number of subscribers served by a system may give some insight into the degree to which consolidation is being effected. If, in presenting the data concerning the TCC's in a geographical area, it comes to light that there are a number of small TCC's serving a relatively small number of subscribers with low message volumes, consolidation may be indicated.

Another planning principle which may be considered in the analysis is connectivity. Those costs associated with the RIXT's can be considered

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NTCC NSA NEW ORLEANS
Life Cycle Evaluation Data

| | Other Automated System | LDMX | RIXT | LDMX Total System |
|---|---|---|---|---|
| Total Messages (FY80 through FY85) | N/A | 5,643.0K | 1,388.0K | 7,031.0K |
| Total Subscribers Served | N/A | 34 | 50 | 84 |
| Total Sites Automated | N/A | 1 | 3 | 4 |
| Incremental Improvement in Speed of Service | N/A | N/A | N/A | N/A |
| Incremental Improvement in Reliability | N/A | N/A | N/A | N/A |
| Incremental Improvement in Accuracy | N/A | N/A | N/A | N/A |
| Incremental PVLCC | N/A | $2,616.6K | $380.6K | $2,997.2K |

Table V-8

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connectivity costs primarily because they allow the RIXT's subscribers access to the major systems, such as WWMCCS or NCS, which interface with the LDMX. In Tables V-4 and V-8, RIXT-related costs were presented aside from total system costs in order that the decision-maker be better able to decide whether the benefit of connectivity is worth the cost.

The interdependent relationship between the LDMX and the RIXT should be considered in evaluating the LDMX total system. The RIXT receives much benefit from the connectivity to the LDMX at a substantially lower capital and receiving cost than the installation of a stand-alone system. In turn, the LDMX achieves a larger base of operations over which to spread its costs. If the RIXT facilities do not provide a large enough message volume, then overall savings in manpower and recurring costs will not occur. (See Section II.D.)

This concept can best be evaluated by analyzing the alternatives affecting the RIXT installations as a group. As can be seen in Table V-2, actual savings occur in FY83-85, to the amount of $201.7K. In applying the total system concept, the savings are applicable to the system as a whole, because, without the LDMX, these savings would not have occurred. It is important to note that, while these savings benefit the DoD budget, they may not affect the Navy budget, depending upon the service affiliation of the TCC incurring the savings.

## VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Events in the mid-sixties caused a revolution in the field of military communications. For many years previous to this time, little innovation and technical change had taken place. As a result of the fleet exercise BASELINE II and decisions made subsequent to it, great strides were made in providing state-of-the-art automation to all communications facilities regardless of cost. After the first phase of implementation of this policy, when all major TCC's and NAVCAMS were automated, the main thrust of automation shifted somewhat, and the Navy decided to provide for the automation of NTS in the most economical manner possible. The fundamental decision to provide complete automation for communications facilities, a decision which was made in the mid-sixties, still appears to be the principal objective of naval communications. Somehow, this seems incongruous in light of the changes in operating conditions over the past fifteen years. No longer are major shore communications facilities operated in manual modes. The concept that more automation always provides improvements in effectiveness is subject to challenge. If a TCC processes an inordinately small volume of traffic, automation may not provide any appreciable improvement in reliability, accuracy, or speed of service, yet may drastically increase the manpower and other operating costs. A change needs to be made to the primary objective, recognizing that automation of the NTS is not absolute—that there are other alternatives.

The method of analysis of TCC's used by the Navy today is inadequate, because it fails to deal with other than easily quantifiable data such as traffic volume, recurring and non-recurring costs, and manpower costs. It does not provide sufficient data to enable decision-makers to determine what specific benefits can be achieved at what cost. The feasibility studies also fall short in this respect. Decision-makers are forced to choose between complete automation and little or not automation.

Because of these shortcomings in the current analysis method, it may be difficult to justify some of the decisions which have been made and are being made. For instance, in comparing the LDMX/RIXT configurations to be installed at NSA (EB) New Orleans and at NTCC Breezy Point, this author's analysis shows that NSA (EB) New Orleans can be automated for 30% higher incremental PVLCC in order to process 59% fewer messages, for 50% fewer subscribers, at 33% fewer sites. (See Tables V-4 and V-8.) This does not appear to reflect the philosophy of automation in the most economical manner possible. In the present tight-budget climate, the decision to automate NSA (EB) New Orleans might be very hard to justify on a cost-effectiveness basis.

B. RECOMMENDATIONS

In consideration of austere budgeting and specific objectives in the NTAP SPP, and in order to utilize resources most efficiently, it is strongly recommended that the primary objective of automation of the NTS be further modified to reflect the goal of implementing that degree of automation which is most cost-effective. In conjunction with this change to the primary objective, economic analysis of sites being evaluated must reflect the

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specific amounts of improvement expected to be derived. Detailed analysis of the current operating situation will involve expenditure of additional time and funds, but will provide for more efficient use of resources in the long run.

Secondly, the analysis must reflect more than the baseline and one other alternative. Multiple alternatives provide decision-makers with the information necessary to make choices that are more cost-effective and realistic than "all-or-nothing." Projected improvements in effectiveness measures must be included, with proposed costs for each alternative. This allows decision-makers to make comparisons among the various effectiveness measures and costs in order to make choices which fulfill the primary objective.

Based upon the evaluation of the proposed LDMX/RIXT configuration to be installed at NSA (EB) New Orleans, it is recommended that that proposal undergo further study. Utilizing the information available within the feasibility study, it is clear that the incremental PVLCC is not too much greater than the incremental PVLCC of the proposed installation at NTCC Breezy Point, but that the volume of traffic and number of subscribers are significantly lower. The assumption can be made that, since volume underlies the levels of reliability, accuracy, and speed of service, the increase in these measures of effectiveness may not be significant with the implementation of LDMX/RIXT configuration at NSA (EB) New Orleans. In re-evaluating this proposed site, consideration should be given to alternatives other than LDMX/RIXT, as it may occur that the same improvements can be achieved with a lower cost using some other automated system than those considered in the analysis.

*Cost Data for NTCC Breezy Point*
*and NTCC NSA New Orleans*
*LDMX/RIXT Systems*


The cost data for each LDMX and RIXT installation is presented in Tables A-1 through A-13. In each Table, "Alternative 1" refers to the base-line alternative--in other words, maintaining the present system. "Alternative 2" refers to the installation of LDMX or RIXT.

Non-recurring costs include purchase cost, if applicable; installation; acceptance testing; system training/test acceptance; and site preparation. Supplies include administrative consumables, perforated paper tape, magnetic tape, and data cards. Total recurring costs do not include manpower costs.

All cost figures are presented in thousands of dollars. Information is drawn from References 2 and 3.

NTCC BREEZY POINT
COST DATA

|  | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|
|  | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | -- | -- | -- | 270.0 | -- | 904.4 | -- | -- | -- | -- |
| RECURRING COSTS |  |  |  |  |  |  |  |  |  |  |
| Supplies | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 | 92.8 |
| Repair Parts |  |  |  |  |  |  |  |  |  |  |
| Reproduction | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 | 51.7 |
| Offline Equip. | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | -- | 31.4 | -- | 31.4 | -- |
| AUTODIN Equip. | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | -- | 6.7 | -- | 6.7 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 89.8 | 89.8 | 89.8 | 89.8 | 89.8 | 51.7 | 89.8 | 51.7 | 89.8 | 51.7 |
| Leases |  |  |  |  |  |  |  |  |  |  |
| AUTODIN Circuits | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | 6.6 | 3.3 | 6.6 | 3.3 | 6.6 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 145.0 | -- | 145.0 | -- | 145.0 |
| Other | -- | -- | -- | -- | -- | 19.0 | -- | 19.0 | -- | 19.0 |
| TOTAL | 3.3 | 3.3 | 3.3 | 3.3 | 3.3 | 170.6 | 3.3 | 170.6 | 3.3 | 170.6 |
| TOTAL RECURRING COSTS | 185.9 | 185.9 | 185.9 | 185.9 | 185.9 | 315.1 | 185.9 | 315.1 | 185.9 | 315.1 |

Table A-1

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TCC NAS OCEANA
COST DATA

| | FY80 ALTERNATIVE 1 | 2 | FY81 ALTERNATIVE 1 | 2 | FY82 ALTERNATIVE 1 | 2 | FY83 ALTERNATIVE 1 | 2 | FY84 ALTERNATIVE 1 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 350.4 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 | 21.7 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 | 11.4 |
| Offline Equip. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| AUTODIN Equip. | 9.1 | 9.1 | 9.1 | 9.1 | 9.1 | -- | 9.1 | -- | 9.1 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 20.5 | 20.5 | 20.5 | 20.5 | 20.5 | 11.4 | 20.5 | 11.4 | 20.5 | 11.4 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | .8 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 16.5 | -- | 16.5 | -- | 16.5 |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | 17.3 | 3.4 | 17.3 | 3.4 | 17.3 |
| TOTAL RECURRING COSTS | 45.6 | 45.6 | 45.6 | 45.6 | 45.6 | 50.4 | 45.6 | 50.4 | 45.6 | 50.4 |

Table A-2

NTCC NSC NORFOLK
COST DATA

| | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 350.4 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 51.6 | 51.6 | 51.6 | 51.6 | 51.6 | 43.5 | 51.6 | 43.5 | 51.6 | 43.5 |
| Repair Parts | | | | | | | | | | |
| Reproduction | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Offline Equip. | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .3 | .3 |
| AUTODIN Equip. | 17.7 | 17.7 | 17.7 | 17.7 | 17.7 | -- | 17.7 | -- | 17.7 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 18.0 | 18.0 | 18.0 | 18.0 | 18.0 | .3 | 18.0 | .3 | 18.0 | .3 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | .2 | 5.7 | .2 | 5.7 | .2 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 16.5 | -- | 16.5 | -- | 16.5 |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 16.7 | 5.7 | 16.7 | 5.7 | 16.7 |
| TOTAL RECURRING COSTS | 75.3 | 75.3 | 75.3 | 75.3 | 75.3 | 60.5 | 75.3 | 60.5 | 75.3 | 60.5 |

Table A-3

TCC YORKTOWN
COST DATA

| | FY80 | | FY81 | | FY82 | | FY83 | | FY84 | |
| | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | |
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 350.4 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 |
| Repair Parts | | | | | | | | | | |
| Reproduction | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 | .1 |
| Offline Equip. | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | -- | 4.4 | -- | 4.4 | -- |
| AUTODIN Equip. | .5 | .5 | .5 | .5 | .5 | -- | .5 | -- | .5 | -- |
| Other | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | -- | 1.7 | -- | 1.7 | -- |
| TOTAL | 6.7 | 6.7 | 6.7 | 6.7 | 6.7 | .1 | 6.7 | .1 | 6.7 | .1 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | .7 | 2.7 | .7 | 2.7 | .7 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 16.5 | -- | 16.5 | -- | 16.5 |
| Other | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | -- | 1.6 | -- | 1.6 | -- |
| TOTAL | 4.3 | 4.3 | 4.3 | 4.3 | 4.3 | 17.2 | 4.3 | 17.2 | 4.3 | 17.2 |
| TOTAL RECURRING COSTS | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 24.2 | 17.9 | 24.2 | 17.9 | 24.2 |

Table A-4

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TCC USCG DISTRICT 5
COST DATA

| | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | 47.7 | -- | 37.6 | -- | 96.0 | -- | -- | 79.2 | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 70.7 | 70.7 | 70.7 | 70.7 | 70.7 | 65.6 | 70.7 | 65.6 | 70.7 | 65.6 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 | 6.9 |
| Offline Equip. | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| AUTODIN Equip. | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 | -- | 5.1 | -- | 5.1 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 9.9 | 15.0 | 9.9 | 15.0 | 9.9 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | .7 | 2.7 | .7 | 2.7 | .7 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 5.1 | -- | 9.9 | -- | 9.9 |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 5.8 | 2.7 | 10.6 | 2.7 | 10.6 |
| TOTAL RECURRING COSTS | 88.4 | 88.4 | 88.4 | 88.4 | 88.4 | 81.3 | 88.4 | 86.1 | 88.4 | 86.1 |

Table A-5

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NTCC PORTSMOUTH
COST DATA

| | FY80 | | FY81 | | FY82 | | FY83 | | FY84 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | |
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 350.4 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 | 25.6 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 | 5.7 |
| Offline Equip. | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .2 | .2 |
| AUTODIN Equip. | 12.2 | 12.2 | 12.2 | 12.2 | 12.2 | -- | 12.2 | -- | 12.2 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 18.1 | 18.1 | 18.1 | 18.1 | 18.1 | 5.9 | 18.1 | 5.9 | 18.1 | 5.9 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 3.4 | 3.4 | 3.4 | 3.4 | 3.4 | .9 | 3.4 | .9 | 3.4 | .9 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 16.5 | -- | 16.5 | -- | 16.5 |
| Other | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | -- | 1.0 | 1.0 | 1.0 | -- |
| TOTAL | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 17.4 | 4.4 | 17.4 | 4.4 | 17.4 |
| TOTAL RECURRING COSTS | 48.1 | 48.1 | 48.1 | 48.1 | 48.1 | 48.9 | 48.1 | 48.9 | 48.1 | 48.9 |

Table A-6

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## NTCC BREEZY POINT LDMX TOTAL SYSTEM
## COST DATA

| | FY80 | | FY81 | | FY82 | | FY83 | | FY84 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | | ALTERNATIVE | |
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | 47.7 | -- | 37.6 | 270.0 | 96.0 | 1401.0 | -- | 79.2 | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 269.3 | 269.3 | 269.3 | 269.3 | 269.3 | 256.1 | 269.3 | 256.1 | 269.3 | 256.1 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 | 75.8 |
| Offline Equip. | 39.3 | 39.3 | 39.3 | 39.3 | 39.3 | 3.5 | 39.3 | 3.5 | 39.3 | 3.5 |
| AUTODIN Equip. | 51.3 | 51.3 | 51.3 | 51.3 | 51.3 | -- | 51.3 | -- | 51.3 | -- |
| Other | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | -- | 1.7 | -- | 1.7 | -- |
| TOTAL | | | | | | | | | | |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 21.2 | 21.2 | 21.2 | 21.2 | 21.2 | 9.9 | 21.2 | 9.9 | 21.2 | 9.9 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 216.1 | -- | 226.0 | -- | 226.0 |
| Other | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 19.0 | 2.6 | 19.0 | 2.6 | 19.0 |
| TOTAL | 23.8 | 23.8 | 23.8 | 23.8 | 23.8 | 245.0 | 23.8 | 254.9 | 23.8 | 254.9 |
| TOTAL RECURRING COSTS | 461.2 | 461.2 | 461.2 | 461.2 | 461.2 | 580.4 | 461.2 | 590.3 | 461.2 | 590.3 |

Table A-7

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NTCC NSA NEW ORLEANS
COST DATA

| | FY80 ALTERNATIVE 1 | FY80 ALTERNATIVE 2 | FY81 ALTERNATIVE 1 | FY81 ALTERNATIVE 2 | FY82 ALTERNATIVE 1 | FY82 ALTERNATIVE 2 | FY83 ALTERNATIVE 1 | FY83 ALTERNATIVE 2 | FY84 ALTERNATIVE 1 | FY84 ALTERNATIVE 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 1174.4 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 | 41.4 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 | 53.5 |
| Offline Equip. | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| AUTODIN Equip. | 57.0 | 57.0 | 57.0 | 57.0 | 57.0 | -- | 57.0 | -- | 57.0 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 112.5 | 112.5 | 112.5 | 112.5 | 112.5 | 55.5 | 112.5 | 55.5 | 112.5 | 55.5 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 11.0 | 5.5 | 11.0 | 5.5 | 11.0 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 145.0 | -- | 145.0 | -- | 145.0 |
| Other | -- | -- | -- | -- | -- | 19.0 | -- | 19.0 | -- | 19.0 |
| TOTAL | 5.5 | 5.5 | 5.5 | 5.5 | 5.5 | 175.0 | 5.5 | 175.0 | 5.5 | 175.0 |
| TOTAL RECURRING COSTS | 159.4 | 159.4 | 159.4 | 159.4 | 159.4 | 271.9 | 159.4 | 271.9 | 159.4 | 271.9 |

Table A-8

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NTCC NEW ORLEANS DET BELLE CHASSE
COST DATA

| | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 349.6 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 5.4 | 4.0 | 5.4 | 4.0 | 5.4 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| Offline Equip. | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | -- | 1.4 | -- | 1.4 | -- |
| AUTODIN Equip. | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | -- | 4.5 | -- | 4.5 | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 17.9 | 17.9 | 17.9 | 17.9 | 17.9 | 12.0 | 17.9 | 12.0 | 17.9 | 12.0 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | 17.1 | -- | 17.1 | -- | 17.1 |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 20.1 | 3.0 | 20.1 | 3.0 | 20.1 |
| TOTAL RECURRING COSTS | 24.9 | 24.9 | 24.9 | 24.9 | 24.9 | 37.5 | 24.9 | 37.5 | 24.9 | 37.5 |

Table A-9

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TCC 159TH TFG NEW ORLEANS
COST DATA

| | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 1.4 | 1.4 | 1.4 | 1.4 | 1.4 | -- | 1.4 | -- | 1.4 | -- |
| Repair Parts | | | | | | | | | | |
|   Reproduction | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|   Offline Equip. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|   AUTODIN Equip. | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | -- | 10.3 | -- | 10.3 | -- |
|   Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|   TOTAL | 10.3 | 10.3 | 10.3 | 10.3 | 10.3 | -- | 10.3 | -- | 10.3 | -- |
| Leases | | | | | | | | | | |
|   AUTODIN Circuits | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | -- | 2.9 | -- | 2.9 | -- |
|   LDMX/RIXT Maint. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|   Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|   TOTAL | 2.9 | 2.9 | 2.9 | 2.9 | 2.9 | -- | 2.9 | -- | 2.9 | -- |
| TOTAL RECURRING COSTS | 14.6 | 14.6 | 14.6 | 14.6 | 14.6 | -- | 14.6 | -- | 14.6 | -- |

Table A-10

TCC LMVD VICKSBURG DISTRICT USA COE VICKSBURG
COST DATA

| | FY80 ALTERNATIVE 1 | FY80 ALTERNATIVE 2 | FY81 ALTERNATIVE 1 | FY81 ALTERNATIVE 2 | FY82 ALTERNATIVE 1 | FY82 ALTERNATIVE 2 | FY83 ALTERNATIVE 1 | FY83 ALTERNATIVE 2 | FY84 ALTERNATIVE 1 | FY84 ALTERNATIVE 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NON-RECURRING COSTS | -- | -- | -- | -- | -- | 248.3 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| Offline Equip. | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| AUTODIN Equip. | 5.1 | 5.1 | 5.1 | 9.8 | 5.1 | 9.8 | 5.1 | 9.8 | 5.1 | 9.8 |
| Other | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 |
| TOTAL | 25.9 | 25.9 | 25.9 | 30.6 | 25.9 | 30.6 | 25.9 | 30.6 | 25.9 | 30.6 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| TOTAL RECURRING COSTS | 29.7 | 29.7 | 29.7 | 29.7 | 29.7 | 34.4 | 29.7 | 34.4 | 29.7 | 34.4 |

Table A-11

64

TCC NAVAL CBC GULFPORT
COST DATA

| | FY80 ALTERNATIVE 1 | FY80 ALTERNATIVE 2 | FY81 ALTERNATIVE 1 | FY81 ALTERNATIVE 2 | FY82 ALTERNATIVE 1 | FY82 ALTERNATIVE 2 | FY83 ALTERNATIVE 1 | FY83 ALTERNATIVE 2 | FY84 ALTERNATIVE 1 | FY84 ALTERNATIVE 2 |
|---|---|---|---|---|---|---|---|---|---|---|
| NON-RECURRING COSTS | 47.7 | -- | 37.6 | -- | 96.0 | 45.6 | -- | -- | -- | -- |
| **RECURRING COSTS** | | | | | | | | | | |
| Supplies | .4 | .4 | .4 | .4 | .4 | .4 | .4 | .4 | .4 | .4 |
| Repair Parts | | | | | | | | | | |
| Reproduction | .8 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | .8 | .8 |
| Offline Equip. | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| AUTODIN Equip. | 5.1 | 5.1 | 5.1 | 5.1 | -- | -- | -- | -- | -- | -- |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 8.9 | 8.9 | 8.9 | 8.9 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 2.7 | 3.2 | 2.7 | 3.2 | 2.7 | 3.2 | 2.7 | 3.2 | 2.7 | 3.2 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 | 8.5 |
| Other | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL | 2.7 | 3.2 | 2.7 | 3.2 | 11.2 | 11.7 | 11.7 | 11.7 | 11.7 | 11.7 |
| TOTAL RECURRING COSTS | 12.0 | 12.5 | 12.0 | 12.5 | 15.4 | 15.9 | 15.4 | 15.9 | 15.4 | 15.9 |

Table A-12

NSA (EB) NEW ORLEANS LDMX TOTAL SYSTEM
COST DATA

| | FY80 ALTERNATIVE | | FY81 ALTERNATIVE | | FY82 ALTERNATIVE | | FY83 ALTERNATIVE | | FY84 ALTERNATIVE | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| NON-RECURRING COSTS | 47.7 | -- | 37.6 | -- | 96.2 | 1817.9 | -- | -- | -- | -- |
| RECURRING COSTS | | | | | | | | | | |
| Supplies | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 | 49.2 |
| Repair Parts | | | | | | | | | | |
| Reproduction | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 | 69.3 |
| Offline Equip. | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 | 6.0 | 7.4 | 6.0 | 7.4 | 6.0 |
| AUTODIN Equip. | 82.0 | 82.0 | 82.0 | 82.0 | 76.9 | 9.8 | 76.9 | 9.8 | 76.9 | 9.8 |
| Other | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 | 16.8 |
| TOTAL | 175.5 | 175.5 | 175.5 | 175.5 | 170.4 | 101.9 | 170.4 | 101.9 | 170.4 | 101.9 |
| Leases | | | | | | | | | | |
| AUTODIN Circuits | 15.9 | 16.4 | 15.9 | 16.4 | 15.9 | 19.0 | 15.9 | 19.0 | 15.9 | 19.0 |
| LDMX/RIXT Maint. | -- | -- | -- | -- | 8.5 | 170.6 | 8.5 | 170.6 | 8.5 | 170.6 |
| Other | -- | -- | -- | -- | -- | 19.0 | -- | 19.0 | -- | 19.0 |
| TOTAL | 15.9 | 16.4 | 15.9 | 16.4 | 24.4 | 208.6 | 24.4 | 208.6 | 24.4 | 208.6 |
| TOTAL RECURRING COSTS | 240.6 | 241.1 | 240.6 | 241.1 | 244.0 | 359.7 | 244.0 | 359.7 | 244.0 | 359.7 |

Table A-13

66

*Traffic Data for NTCC Breezy Point*
*and NTCC NSA New Orleans*
*LDMX/RIXT Systems*

The traffic data for each LDMX and RIXT installation is presented in Table B-1 through B-13. Data for FY81 through FY84 were computed by applying the annual rate of change to the FY80 actual data. Daily volume entries represent actual monthly volumes averaged to a daily figure, and the entry labelled "High Day Total" represents total volume experienced on an average high-volume day. Annual volumes are simply 365 times the daily averages.

All figures presented in this appendix were drawn from References 2 and 3.

NTCC BREEZY POINT
TRAFFIC DATA

60 Subscriber Commands
Annual Rate of Change = 5.82%

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 2228 | 2353 | 2495 | 2640 | 2794 | 2957 |
| Data | 159 | 168 | 178 | 188 | 199 | 211 |
| Total | 2387 | 2521 | 2673 | 2828 | 2993 | 3168 |
| **HIGH DAY** | | | | | | |
| Narrative | 7652 | 8097 | 8518 | 9014 | 9539 | 10094 |
| Data | 197 | 208 | 221 | 233 | 247 | 261 |
| Total | 7849 | 8305 | 8739 | 9247 | 9786 | 10355 |
| **ANNUAL VOLUME** | 871K | 920K | 976K | 1032K | 1092K | 1156K |

Table B-1

68

TCC NAS OCEANA
TRAFFIC DATA

43 Subscriber Commands

Annual Rate of Change:
Narrative = 8.5%
Data = 18.6%

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 474 | 514 | 558 | 605 | 657 | 713 |
| Data | 137 | 162 | 193 | 228 | 270 | 320 |
| Total | 611 | 676 | 751 | 833 | 927 | 1033 |
| **HIGH DAY** | | | | | | |
| Narrative | 855 | 928 | 1006 | 1092 | 1185 | 1286 |
| Data | 288 | 342 | 405 | 480 | 570 | 676 |
| Total | 1143 | 1270 | 1411 | 1572 | 1755 | 1962 |
| **ANNUAL VOLUME** | 233K | 247K | 274K | 304K | 338K | 377K |

Table B-2

69

NTCC NSC NORFOLK
TRAFFIC DATA

15 Subscriber Commands
Annual Rate of Change:
Narrative = 7.4%
Data = 7.5%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 871 | 953 | 1005 | 1079 | 1159 | 1245 |
| Data | 843 | 906 | 974 | 1047 | 1126 | 1210 |
| Total | 1714 | 1859 | 1979 | 2126 | 2285 | 2455 |
| **HIGH DAY** | | | | | | |
| Narrative | 1531 | 1644 | 1245 | 1337 | 1436 | 1542 |
| Data | 1414 | 1520 | 1634 | 1757 | 1888 | 2030 |
| Total | 2945 | 3164 | 2879 | 3094 | 3324 | 3572 |
| **ANNUAL VOLUME** | 626K | 679K | 722K | 776K | 834K | 896K |

Table B-3

TCC YORKTOWN
TRAFFIC DATA

8 Subscriber Commands
Annual Rate of Change:
Narrative = 11.1%
Data = 2.0%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 230 | 256 | 284 | 315 | 350 | 389 |
| Data | 266 | 271 | 277 | 282 | 288 | 294 |
| Total | 496 | 527 | 561 | 597 | 638 | 683 |
| **HIGH DAY** | | | | | | |
| Narrative | 260 | 289 | 321 | 357 | 396 | 440 |
| Data | 362 | 369 | 378 | 384 | 392 | 400 |
| Total | 628 | 658 | 699 | 741 | 788 | 840 |
| **ANNUAL VOLUME** | 181K | 192K | 205K | 218K | 234K | 249K |

Table B-4

71

TCC USCG DISTRICT 5
TRAFFIC DATA

6 Subscriber Commands
Annual Rate of Change:
Narrative = 3.3%
Data = 0

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 484 | 500 | 516 | 534 | 551 | 569 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 484 | 500 | 516 | 534 | 551 | 569 |
| **HIGH DAY** | | | | | | |
| Narrative | 262 | 271 | 280 | 289 | 299 | 309 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 262 | 271 | 280 | 289 | 299 | 309 |
| **ANNUAL VOLUME** | 177K | 183K | 188K | 193K | 201K | 208K |

Table B-5

72

NTCC PORTSMOUTH
TRAFFIC DATA

Annual Rate of Change:
Narrative = 5.5%
Data = 7.0%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **ILY AVERAGE** | | | | | | |
| Narrative | 803 | 847 | 895 | 943 | 995 | 1050 |
| Data | 153 | 164 | 175 | 187 | 201 | 215 |
| Total | 956 | 1011 | 1070 | 1130 | 1196 | 1265 |
| **HIGH DAY** | | | | | | |
| Narrative | 1402 | 1479 | 1560 | 1646 | 1737 | 1834 |
| Data | 462 | 494 | 529 | 566 | 606 | 648 |
| Total | 1864 | 1973 | 2089 | 2212 | 2343 | 2482 |
| **ANNUAL VOLUME** | 349K | 369K | 391K | 412K | 437K | 462K |

Table B-6

73

NTCC BREEZY POINT LDMX TOTAL SYSTEM
TRAFFIC DATA

169 Subscriber Commands
Annual Rate of Change = 6.2%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 5090 | 5423 | 5753 | 6116 | 6506 | 6923 |
| Data | 1558 | 1671 | 1797 | 1932 | 2084 | 2250 |
| Total | 6648 | 7094 | 7550 | 8048 | 8590 | 9173 |
| **HIGH DAY** | | | | | | |
| Narrative | 11962 | 12708 | 12930 | 13735 | 14592 | 15196 |
| Data | 2723 | 2933 | 3167 | 3420 | 3703 | 4015 |
| Total | 14685 | 15641 | 16097 | 17155 | 18295 | 19211 |
| **ANNUAL VOLUME** | 2427K | 2589K | 2756K | 2938K | 3135K | 3348K |

Table B-7

74

NTCC NSA (EB) NEW ORLEANS
TRAFFIC DATA

34 Subscriber Commands

Annual Rate of Change:
Narrative = 9.0%
Data = 11.9%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 1911 | 2083 | 2270 | 2475 | 2698 | 2941 |
| Data | 134 | 150 | 168 | 188 | 210 | 235 |
| Total | 2045 | 2233 | 2438 | 2663 | 2908 | 3176 |
| **HIGH DAY** | | | | | | |
| Narrative | 3200 | 3488 | 3802 | 4144 | 4517 | 4924 |
| Data | 230 | 257 | 288 | 322 | 361 | 404 |
| Total | 3430 | 3745 | 4090 | 4466 | 4878 | 5328 |
| **ANNUAL VOLUME** | 746K | 815K | 890K | 972K | 1061K | 1159K |

Table B-8

75

NTCC NEW ORLEANS DET BELLE CHASSE
TRAFFIC DATA

13 Subscriber Commands

Annual Rate of Change:
Narrative = 1.8%
Data = 0%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 157 | 160 | 163 | 166 | 169 | 172 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 157 | 160 | 163 | 166 | 169 | 172 |
| **HIGH DAY** | | | | | | |
| Narrative | 304 | 309 | 315 | 321 | 326 | 385 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 304 | 309 | 315 | 321 | 326 | 385 |
| **ANNUAL VOLUME** | 57K | 58K | 59K | 61K | 62K | 63K |

Table B-9

**TCC 159TH TFG NEW ORLEANS**
**TRAFFIC DATA**

12 Subscriber Commands

Annual Rate of Change:
Narrative = 23.3%
Data = 24.9%

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 57 | 70 | 87 | 106 | 131 | 148 |
| Data | 11 | 14 | 17 | 21 | 28 | 35 |
| Total | 68 | 84 | 104 | 127 | 159 | 183 |
| **HIGH DAY** | | | | | | |
| Narrative | 25 | 31 | 38 | 47 | 58 | 72 |
| Data | 59 | 74 | 92 | 115 | 144 | 180 |
| Total | 84 | 105 | 130 | 162 | 202 | 252 |
| **ANNUAL VOLUME** | 30K | 38K | 38K | 46K | 58K | 67K |

Table B-10

77

TCC LMVD VICKSBURG DISTRICT USA COE VICKSBURG
TRAFFIC DATA

7 Subscriber Commands

Annual Rate of Change:
Narrative = 10.0%
Data = 0%

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 140 | 154 | 169 | 186 | 205 | 226 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 140 | 154 | 169 | 186 | 205 | 226 |
| **HIGH DAY** | | | | | | |
| Narrative | 217 | 239 | 263 | 289 | 318 | 350 |
| Data | -- | -- | -- | -- | -- | -- |
| Total | 217 | 239 | 263 | 289 | 318 | 350 |
| **ANNUAL VOLUME** | 51K | 56K | 62K | 68K | 75K | 82K |

Table B-11

**TCC NAVAL CBC GULFPORT**
**TRAFFIC DATA**

18 Subscriber Commands

Annual Rate of Change:
Narrative = 5.0%
Data = 5.0%

|  | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 119 | 125 | 131 | 138 | 145 | 152 |
| Data | 33 | 35 | 36 | 38 | 40 | 42 |
| Total | 152 | 160 | 167 | 176 | 185 | 194 |
| **HIGH DAY** | | | | | | |
| Narrative | 185 | 194 | 204 | 214 | 225 | 236 |
| Data | 203 | 213 | 224 | 235 | 247 | 259 |
| Total | 388 | 407 | 428 | 449 | 472 | 497 |
| **ANNUAL VOLUME** | 55K | 58K | 61K | 64K | 68K | 71K |

Table B-12

79

NSA (EB) NEW ORLEANS LDMX TOTAL SYSTEM
TRAFFIC DATA

84 Subscriber Commands
Annual Rate of Change = 8.3%

| | FY80 | FY81 | FY82 | FY83 | FY84 | FY85 |
|---|---|---|---|---|---|---|
| **DAILY AVERAGE** | | | | | | |
| Narrative | 2384 | 2592 | 2820 | 3071 | 3348 | 3659 |
| Data | 178 | 199 | 221 | 247 | 278 | 312 |
| Total | 2562 | 2791 | 3041 | 3318 | 3626 | 3951 |
| **HIGH DAY** | | | | | | |
| Narrative | 3931 | 4261 | 4622 | 5015 | 5444 | 5967 |
| Data | 492 | 544 | 604 | 672 | 752 | 843 |
| Total | 4423 | 4805 | 5226 | 5687 | 6196 | 6810 |
| **ANNUAL VOLUME** | 935K | 1019K | 1110K | 1211K | 1323K | 1442K |

Table B-13

*APPENDIX C*

*Manpower Data for NTCC Breezy Point*
*and NTCC NSA New Orleans*
*LDMX/RIXT Systems*

The manpower data for each LDMX and RIXT installation is presented in Tables C-1 through C-13. Manpower costs were computed on the basis of $26.0K for each officer, $11.0K for each enlisted member, and $18.2K for each civilian. The data sources are References 2 and 3.

NTCC BREEZY POINT
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 1 | 2 |
| Enlisted | 55 | 60 |
| Civilian | 18 | 18 |
| | | |
| MANNING COST | | |
| Officer | $26.0K | $52.0K |
| Enlisted | $605.0K | $660.0K |
| Civilian | $327.6K | $327.6K |
| Total | $958.6K | $1039.6K |

Table C-1

TCC NAS OCEANA
MANPOWER DATA

| | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 21 | 21 |
| Civilian | 0 | 0 |
| | | |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | $231.0K | $231.0K |
| Civilian | -- | -- |
| Total | $231.0K | $231.0K |

Table C-2

83

NTCC NSC NORFOLK
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL |  |  |
| Officer | 0 | 0 |
| Enlisted | 0 | 0 |
| Civilian | 33 | 27 |
| MANNING COST |  |  |
| Officer | -- | -- |
| Enlisted | -- | -- |
| Civilian | $600.6K | $491.4K |
| Total | $600.6K | $491.4K |

Table C-3

TCC YORKTOWN
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 10 | 10 |
| Civilian | 4 | 4 |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | $110.0K | $110.0K |
| Civilian | $72.8K | $72.8K |
| Total | $182.8K | $182.8K |

Table C-4

TCC USCG DISTRICT 5
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
| --- | --- | --- |
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 14 | 14 |
| Civilian | 0 | 0 |
| | | |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | $154.0K | $154.0K |
| Civilian | -- | -- |
| Total | $154.0K | $154.0K |

Table C-5

NTCC PORTSMOUTH
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL |  |  |
| Officer | 0 | 0 |
| Enlisted | 19 | 15 |
| Civilian | 10 | 10 |
| MANNING COST |  |  |
| Officer | -- | -- |
| Enlisted | $209.0K | $165.0K |
| Civilian | $182.0K | $182.0K |
| Total | $391.0K | $347.0K |

Table C-6

NTCC BREEZY POINT LDMX TOTAL SYSTEM
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| **MANNING LEVEL** | | |
| Officer | 1 | 2 |
| Enlisted | 121 | 122 |
| Civilian | 65 | 61 |
| | | |
| **MANNING COST** | | |
| Officer | $26.0K | $52.0K |
| Enlisted | $1331.0K | $1342.0K |
| Civilian | $1183.0K | $1110.2K |
| Total | $2540.0K | $2504.2K |

Table C-7

## NTCC NSA (EB) NEW ORLEANS
## MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| **MANNING LEVEL** | | |
| Officer | 1 | 1 |
| Enlisted | 7 | 7 |
| Civilian | 34 | 59 |
| **MANNING COST** | | |
| Officer | $26.0K | $26.0K |
| Enlisted | $77.0K | $77.0K |
| Civilian | $618.8K | $1073.8K |
| Total | $721.8K | $1176.8K |

Table C-8

NTCC NEW ORLEANS DET BELLE CHASSE
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 4 | 4 |
| Civilian | 4 | 4 |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | $44.0K | $44.0K |
| Civilian | $72.8K | $72.8K |
| Total | $116.8K | $116.8K |

Table C-9

90

TCC 159TH TFG NEW ORLEANS
MANPOWER DATA

| | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 0 | 0 |
| Civilian | 2 | 2 |
| | | |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | -- | -- |
| Civilian | $36.4K | $36.4K |
| Total | $36.4K | $36.4K |

Table C-10

TCC LMVD VICKSBURG DISTRICT USA COE VICKSBURG
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 0 | 0 |
| Civilian | 5 | 5 |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | -- | -- |
| Civilian | $91.0K | $91.0K |
| Total | $91.0K | $91.0K |

Table C-11

TCC NAVAL CBC GULFPORT
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
| --- | --- | --- |
| MANNING LEVEL | | |
| Officer | 0 | 0 |
| Enlisted | 9 | 9 |
| Civilian | 0 | 0 |
| MANNING COST | | |
| Officer | -- | -- |
| Enlisted | $99.0K | $99.0K |
| Civilian | -- | -- |
| Total | $99.0K | $99.0K |

Table C-12

NSA (EB) NEW ORLEANS LDMX TOTAL SYSTEM
MANPOWER DATA

|  | ALTERNATIVE 1 | ALTERNATIVE 2 |
|---|---|---|
| MANNING LEVEL |  |  |
| Officer | 1 | 1 |
| Enlisted | 20 | 20 |
| Civilian | 45 | 70 |
| MANNING COST |  |  |
| Officer | $26.0K | $26.0K |
| Enlisted | $220.0K | $220.0K |
| Civilian | $819.0K | $1274.0K |
| Total | $1065.0K | $1520.0K |

Table C-13

*List of Subscribers*
*to Proposed LDMX Total Systems*
*at NTCC Breezy Point*
*and NTCC NSA (EB) New Orleans*


A.  NTCC BREEZY POINT

  AIR TERMINAL, NAVAL SUPPLY CENTER, NORFOLK, VA

  ARMED FORCES COURIER STATION, NORFOLK, VA

  AVIATION MATERIAL OFFICE, ATLANTIC

  CHIEF OF NAVAL AIR RESERVE, ATLANTIC FLEET REPRESENTATIVE, NORFOLK, VA

  COMMANDER FLEET ELECTRONIC WARFARE SUPPORT GROUP

  COMMANDER, NAVAL AIR FORCES, US ATLANTIC FLEET

  COMMANDER, HELICOPTER RESERVE WING REPRESENTATIVE, ATLANTIC

  COMMANDER, RESERVE PATROL WING ATLANTIC

  COMMANDER, TACTICAL SUPPORT WING ONE

  COMMANDER, SERVICE GROUP TWO

  DEFENSE MAPPING AGENCY OFFICE, NORFOLK, VA

  FLEET ACCOUNTING AND DISBURSING CENTER, ATLANTIC

  NAVY REGIONAL DATA AUTOMATION CENTER

  FLEET TECHNICAL SUPPORT DEPARTMENT

  HEADQUARTERS AND MAINTENANCE SQUADRON 46 DETACHMENT

  MARINE CORPS MEDIUM HELICOPTER SQUADRON 774

  MARINE CORPS AIR BASE SQUADRON

  LIGHT AIRBORNE MULTI-PURPOSE SYSTEMS DETACHMENT 2

  MILITARY AIR TRAFFIC COORDINATION OFFICE

LIGHT HELICOPTER ATTACK SQUADRON FOUR

HELICOPTER MINE COUNTERMEASURES SQUADRON 14

HELICOPTER MINE COUNTERMEASURES SQUADRON 16

HELICOPTER SUPPORT SQUADRON 6

FLEET AVIATION SPECIALIZED OPERATIONAL TRAINING GROUP ATLANTIC

FLEET COMPOSITE SQUADRON 6

FLEET LOGISTIC SUPPORT SQUADRON 40

FLEET LOGISTIC SUPPORT SQUADRON 56

ATLANTIC FLEET AUDIO VISUAL COMMAND

ATLANTIC FLEET NAVAL FACILITIES ENGINEERING COMMAND

ATLANTIC FLEET NAVAL AVIATION ENGINEERING SERVICE COORDINATING OFFICE

NAVAL AIR STATION, NORFOLK, VA

NAVAL COURIER SERVICE DETACHMENT VICTOR

NAVY EDUCATION AND TRAINING SUPPORT CENTER, ATLANTIC

NAVAL AIR MAINTENANCE TRAINING GROUP DETACHMENT

NAVAL AIR REWORK FACILITY

AVIATION PHYSIOLOGY TRAINING UNIT, NAS NORFOLK, VA

NAVY SAFETY CENTER

SUPPLY DEPARTMENT, NAVAL AIR STATION, NORFOLK, VA

NAVAL AIR TECHNICAL TRAINING CENTER, LAKEHURST, NJ, DETACHMENT

OPERATING LOCATION BRAVO, 21ST AIR FORCE

PERSONNEL SUPPORT DETACHMENT, NAVAL AIR STATION, NORFOLK, VA

SHORE BASED INTERMEDIATE MAINTENANCE ACTIVITY, COMNAVAIRLANT

TACTICAL ELECTRONICS WARFARE SQUADRON 33

TACTICAL ELECTRONICS WARFARE SQUADRON 209

20TH STAFF GROUP

AIRCRAFT FERRY SQUADRON 31

CARRIER AIRBORNE EARLY WARNING WING TWELVE

CARRIER AIRBORNE EARLY WARNING SQUADRON 78

CARRIER AIRBORNE EARLY WARNING SQUADRON 121

CARRIER AIRBORNE EARLY WARNING SQUADRON 122

CARRIER AIRBORNE EARLY WARNING SQUADRON 123

CARRIER AIRBORNE EARLY WARNING SQUADRON 124

CARRIER AIRBORNE EARLY WARNING SQUADRON 125

CARRIER AIRBORNE EARLY WARNING SQUADRON 126

CARRIER AIRBORNE EARLY WARNING TRAINING SQUADRON 120

USS AMERICA DETACHMENT NORFOLK, VA

COMMANDER, FLEET AIR DETACHMENT, NORFOLK, VA

NAVAL AIR RESERVE UNIT, NORFOLK, VA

FLEET ELECTRONIC WARFARE SUPPORT GROUP DETACHMENT, NORFOLK, VA

MARINE AIR GROUP DETACHMENT 46, NORFOLK, VA


B.  TCC NAS OCEANA

COMTACWINGSLANT

NAVAL AIR STATION, OCEANA

COMMANDER, MEDIUM ATTACK WING ONE

COMMANDER, FIGHTER WING ONE

MEDIUM ATTACK WING ONE

FIGHTER WING ONE

NAVAL ELECTRONICS SUPPORT UNIT, NAS OCEANA

FIGHTER SQUADRON ONE HUNDRED ONE

FLEET AIR INTELLIGENCE SUPPORT CENTER

FLEET COMPOSITE SQUADRON TWO

NAVAL AIR MAINTENANCE TRAINING DETACHMENTS

ATTACK SQUADRON FORTY-TWO

NAVAL GUIDED MISSILES SCHOOL, DAM NECK

FLEET COMPOSITE SQUADRON TWELVE

FLEET AVIATION SPECIALIZED OPERATIONAL TRAINING GROUP DET

NAVAL OCEANOGRAPHIC OFFICE DETACHMENT OCEANA, VA

FLEET COMPOSITE SQUADRON SIX, DAM NECK, VA

FIGHTER SQUADRON ONE ZERO ONE

FLEET AREA CONTROL AND SURVEILLANCE FACILITY VACAPES, OCEANA, VA

FLEET COMBAT DIRECTION SYSTEMS SUPPORT ACTIVITY, DAM NECK, VA

FLEET COMBAT SYSTEMS TRAINING CENTER ATLANTIC, DAM NECK, VA

PERSONNEL SUPPORT DETACHMENT, OCEANA, VA

PERSONNEL SUPPORT DETACHMENT

TACTICAL ELECTRONIC WARFARE SQUADRON DETACHMENT THREE THREE

COMMANDER, CARRIER AIR WING SIX

COMMANDER, CARRIER AIR WING SEVEN

COMMANDER, CARRIER AIR WING EIGHT

COMMANDER, CARRIER AIR WING ONE

COMMANDER, CARRIER AIR WING ONE SEVEN

NAVAL AIR MAINTENANCE TRAINING TYPE COMMANDER LIAISON OFFICER

NAVAL EDUCATION AND TRAINING SUPPORT CENTER FIELD OFFICE, OCEANA, VA

NAVAL EDUCATION AND TRAINING SUPPORT CENTER FIELD OFFICE, DAM NECK, VA

NAVAL AIR SYSTEMS COMMAND ATLANTIC FIELD SERVICE REP, OCEANA, VA

NAVAL ELECTRONICS ENGINEERING OFFICE, DAM NECK, VA

RESIDENT OFFICER IN CHARGE OF CONSTRUCTION, VBA, OCEANA, VA

NAVAL LEGAL SERVICE DETACHMENT, OCEANA, VA

NAVAL CONSTRUCTION BATTALION UNIT FOUR ONE FIVE, VIRGINIA BEACH, VA

OLAA 20 ADS, OCEANA, VA

EDUCATION AND TRAINING SUPPORT CENTER ATLANTIC, OCEANA, VA

JOINT INTELLIGENCE TASK FORCE DETACHMENT, OCEANA, VA

ANTI-SUBMARINE COMMUNICATIONS TRAINING DETACHMENT, DAM NECK, VA

CENTRAL TEST SITE FOR PTEP, DAM NECK, VA

FLEET ANALYSIS CENTER FIELD OFFICE, OCEANA, VA

C.  NTCC NSC NORFOLK

NAVAL SUPPLY CENTER

DISTRICT SUPPLY OFFICE

DEFENSE PROPERTY DISPOSAL

NAVY MATERIAL TRANSPORTATION OFFICE

US ARMY ENGINEER DISTRICT

NAVY REGIONAL MEDICAL CENTER, PORTSMOUTH, VA

NAVY FOOD MANAGEMENT TEAM

MILITARY SEALIFT COMMAND OFFICE, NORFOLK, VA

FITTING OUT SUPPLY ASSISTANCE TEAM

NAVAL MAINTENANCE AND SUPPLY OFFICE, NORFOLK, VA

SHORE INTERMEDIATE MAINTENANCE ACTIVITY

NAVAL EDUCATION AND TRAINING SUPPORT CENTER, NORFOLK, VA

SUPPLY SYSTEMS SECURITY GROUP, NORFOLK, VA

NAVAL SUPPLY CENTER, STAR, NORFOLK, VA

INPORT SHIPS

D.  TCC YORKTOWN

    NAVAL WEAPONS STATION, YORKTOWN, VA

    NAVAL MINE ENGINEERING FACILITY, YORKTOWN, VA

    US NAVY CARGO HANDLING AND PORT GROUP, WILLIAMSBURG, VA

    US COAST GUARD RESERVE TRAINING CENTER, YORKTOWN, VA

    NAVAL OPHTHALMIC SUPPORT AND TRAINING ACTIVITY, YORKTOWN, VA

    MARINE BARRACKS, YORKTOWN, VA

    SHIPS AT NAVAL WEAPONS STATION PIER

    NMC DETLANT


E.  TCC USCG DISTRICT 5

    COMCOGARD GRU CAPE HATTERAS

    COMMANDER, COAST GUARD GROUP, FORT MACON, NC

    COAST GUARD AIR STATION, ELIZABETH CITY, NC

    COMMANDER, COAST GUARD GROUP EASTERN SHORE

    COMMANDER, COAST GUARD GROUP BALTIMORE

    COMMANDER, COAST GUARD GROUP HAMPTON ROADS


F.  NTCC PORTSMOUTH

    AERONAUTICAL SHIPBOARD INSTALLATION REP, PORTSMOUTH, VA

    CARRIER AND FIELD SERVICE UNIT, PORTSMOUTH, VA

    DEFENSE PROPERTY DISPOSAL OFFICE, PORTSMOUTH, VA

    INACTIVE SHIP MAINTENANCE FACILITY, NORFOLK, VA

    INACTIVE SHIP MAINTENANCE FACILITY, PORTSMOUTH, VA

    INTRAFLEET SUPPLY SUPPORT OPERATIONS TEAM, PORTSMOUTH, VA

    ATLANTIC FLEET SUPPLY OPERATIONS ASSISTANCE PROGRAM, PORTSMOUTH, VA

NAVAL AIR ENGINEERING CENTER, PORTSMOUTH, VA

NAVAL REACTORS REPRESENTATIVE, PORTSMOUTH, VA

NAVAL AUDIT SERVICE SOUTHEAST NAVSHIPYD NORFOLK BRANCH PORTSMOUTH, VA

NAVAL ELECTRONIC SYSTEMS ENGINEERING CENTER, PORTSMOUTH, VA

NAVAL INVESTIGATIVE SERVICE RESIDENT AGENT, PORTSMOUTH, VA

NAVAL REGIONAL DENTAL CENTER NAVSHIPYD NORFOLK BRANCH PORTSMOUTH, VA

NAVAL REGIONAL FINANCE CENTER NAVSHIPYD NORFOLK BRANCH PORTSMOUTH, VA

NAVAL REGIONAL MEDICAL CENTER NAVSHIPYD NORFOLK BRANCH PORTSMOUTH, VA

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SUPERVISOR OF SHIPBUILDING CONVERSION AND REPAIR, PORTSMOUTH, VA

TROSCOM MARINE PROJECTS OFFICE, NORFOLK, VA


G.  NSA (EB) NEW ORLEANS

MILITARY SEALIFT COMMAND

NAVAL RESERVE PERSONNEL CENTER

NAVY REGIONAL DATA AUTOMATION CENTER

COMMANDING GENERAL, FOURTH MARINE AIR WING

NAVAL INVESTIGATIVE SERVICE OFFICE

CHIEF OF NAVAL RESERVE

DEFENSE INVESTIGATIVE SERVICE

NAVAL AIR ELECTRONICS SUPPORT UNIT RESERVE

USAF WATER PORT LOGISTICS OFFICE

NAVAL AND MARINE CORPS RESERVE CENTER

NAVAL RESERVE OFFICER TRAINING CORPS

214TH ELECTRONICS INSTALLATION SQUADRON

DEFENSE LOGISTICS AGENCY

NAVAL RECRUITING DISTRICT

NAVY MEDICAL RESEARCH LAB DET NEW ORLEANS

MARINE AIR RESERVE TRAINING COMMAND

DEFENSE SUBSISTENCE OFFICE

NAVY RECRUITING DISTRICT

MARINE CORPS RECRUITING DISTRICT

COMMANDER, RESERVE TACTICAL SUPPORT WING

3777TH SUPPORT BRIGADE

PANAMA CANAL COMMISSION

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COMMANDER, RESERVE TACTICAL SUPPORT WING LOGISTICS

INSPECTOR INSTRUCTOR STAFF

NAVAL RESERVE SUPPORT OFFICE

USAF RECRUITING DETACHMENT 309

USAF CIVIL AIR PATROL

US ARMY ADVISOR GROUP/NGUS

TAG LA

DIRECTOR RECRUITING COMMAND, DRC US ARMY


H.  NTCC NEW ORLEANS DET BELLE CHASSE

NAS NEW ORLEANS, LA

PATRON NINE FOUR

ATKRON TWO ZERO FOUR

NAVOCEANCOMDET

MAG 46 DET BELLE CHASSE, LA

MRATSU, BELLE CHASSE, LA

PERSUPPDET, NAS NEW ORLEANS, LA

926TH TFG, NAS NEW ORLEANS, LA

159TH NAS, NEW ORLEANS, LA

DET 1, 147TH FIG, NAS NEW ORLEANS, LA

FLELOGSUPPRON FIVE FOUR

USCG AIR STATION, NEW ORLEANS, LA

US CUSTOMS SERVICE, AIR SUPPORT BRANCH, NAS NEW ORLEANS, LA


I.  TCC 159TH TFG NEW ORLEANS

HQ, 159TH TACTICAL FIGHTER GROUP

159TH CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON

159TH COMBAT SUPPORT SQUADRON

159TH RESOURCES MANAGEMENT SQUADRON

122ND TACTICAL FIGHTER SQUADRON

159TH COMMUNICATIONS FLIGHT

159TH WEAPONS SYSTEMS SECURITY FLIGHT

159TH TAC CLINIC

159TH CIVIL ENGINEERING FLIGHT

122ND WEATHER FLIGHT

236TH ATCF/COMBAT COMM FLIGHT

926TH TACTICAL FIGHTER GROUP


J.  TCC VICKSBURG DISTRICT USA COE VICKSBURG

LOWER MISSISSIPPI VALLEY DIVISION (LMVD), CORPS OF ENGINEERS

VICKSBURG DISTRICT, US ARMY CORPS OF ENGINEERS

412TH ENGINEER COMMAND

168TH ENGINEER GROUP

156TH MS, 121ST ARCOM, BIRMINGHAM, AL

MEMPHIS DISTRICT CE

WATERWAYS EXPERIMENT STATION


K.  TCC NAVAL CBC GULFPORT

CBC GULFPORT, MS

COMMANDER, TWENTIETH NAVAL CONSTRUCTION REGIMENT

COMCBLANT DETACHMENT GULFPORT

NAVAL AEROSPACE REGIONAL MEDICAL CENTER BRANCH CLINIC

NAVAL CONSTRUCTION TRAINING CENTER, GULFPORT, MS

INSPECTOR-INSTRUCTOR STAFF USMCR

FOURTH ASSAULT AMPHIBIAN BATTALION, COMPANY A, USMCR

NAVIGATIONAL AIDS SUPPORT UNIT

RESIDENT OFFICER IN CHARGE OF CONSTRUCTION, GULFPORT AREA

US NAVAL HOME, GULFPORT, MS

PERSONNEL SUPPORT DETACHMENT, GULFPORT, MS

USCGC ACUSHNET

MISSISSIPPI AIR NATIONAL GUARD TRAINING SITE

REPORTING OFFICER, GULFPORT, MS

NAVAL AND MARINE CORPS RESERVE CENTER, GULFPORT, MS

173RD CIVIL ENGINEERING FLIGHT

AVIATION CLASSIFICATION REPAIR ACTIVITY DEPOT

255TH COMBAT COMMUNICATIONS SQUADRON (CONTG)

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3.  Inter-Service Agency Extension of Automation Feasibility Study, Norfolk Area, August, 1980

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5.  Naval Communications Automation Program Subsystem Project Plan, 1969 (revised 1970)

6.  Naval Communications Automation Program Subsystem Project Plan, 1969 (revised 1972)

7.  Naval Telecommunications Automation Program Subsystem Project Plan, 1969 (revised 1977, Change 1 dated April 1980)

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